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FRONTIER WORK ON THE BOLIVIA-BRAZIL BOUNDARY, 1911-12.*

By Commander HERBERT A. EDWARDS, R.D., R.N.R., F.R.A.S., F.R.G.S.

The object of this paper, as its title states, is to give a short account of the survey work on the northern boundary between Bolivia and Brazil, carried out by the Commissions appointed by the two Governments, under the conditions of the Treaty of Petropolis (1903). It deals with some of the region with which the name of the explorer Chandless (1862-66) is associated, and into which he was followed by General Pando and Mr. Satchell in 1893. Colonel, then Major, Fawcett headed an exploratory party through part of this region in 1907, and it was upon the information that he brought back with him that it was thought feasible to equip our expedition of 1911, which arrived at Manaos in March of that year, and started a month later on its 2000-mile journey up the river Purus and its tributary the Acre, in order to arrive on the boundary at the beginning of the dry season.

The main streams of these two rivers, the Purus and the Acre, are fairly well known, and are open to small steamer navigation for four or five months during the wet season of each year (December to April), during which time supplies of food are rushed up to the depôts situated on the river-banks, and a large quantity of indiarubber is brought down. Our party arrived in Empreza, the capital of the prefecture of the Acre, in May, having experienced fire and shipwreck, involving the loss of a great part of our provisions and stores *en route*. At Empreza, a town of about 1200 inhabitants, we were hospitably entertained by the Prefect, who enthusiastically explained to us his schemes of improvement, and was

* Royal Geographical Society, May 5, 1913. Map, p. 224.

particularly proud of the installation of a wireless station, which was just being erected. Leaving Empreza and organized civilization behind us, we proceeded up river in a small launch and canoes to Capatara, a depôt and headquarters of a rubber company, consisting of an open clearing on the bank of the river, in which a wooden store and some native houses or barracas had been built. It had been arranged for our party to establish a base at Capatara, from which we could strike inland to the nearest point on the line of the boundary, viz. the river Rapirran, so we landed our stores, instruments, etc., pitched camp, and began our preparations. We were now fairly in the region of the "Inferno verde," or Green hell, the happily descriptive name given by Brazilians to the region of the Acre, and this was speedily emphasized and brought home to us a few days after our arrival by a fierce quarrel among the lawless people of the depôt, which culminated in the murder of one of the disputants in a particularly brutal and cowardly manner.

Here, too, we had our first experience of the "Vriajem," or "cold snap," known in Bolivia as the "Suraçon." This is a sudden change in the weather, usually heralded by a fierce storm of icy cold rain and wind, during which the temperature falls rapidly from its normal of about 90° F. in the shade (110°–120° F. in the open) to round about 47° F. These "friajems" last from four to seven days, and are of frequent occurrence during the dry season from May to September, causing great inconvenience, and even hardship, to the sun-loving worker in these parts, who, during the continuance of the low temperature, rarely leaves his hut or hammock. In the forest all is still, not an animal moves from its nest or lair, the birds sit dumbly huddled together among the topmost branches of the trees, the silence of the swamps is unbroken by the usual music of the frogs, the leaves of many trees and shrubs close together, and many crumple up and die. All nature appears in a state of suspended animation, but bursts forth into exuberance again as soon as the sun shines and the sky clears.

Leaving the little clearing at Capatara, we passed immediately into the forest, along a beaten track, furrowed like a ploughed field, in the mud of which we splashed along, across a series of ridges, with valleys between, each little valley having its silver stream of water meandering through it. The surface soil appears to be some sort of red earth, with frequent patches of beautiful white and yellow sand, and the absence of any sort of stone, rock, or even pebble is very noticeable. Passing into the valley of the Iquiry, which is very plainly defined on either side, by steep banks, and fording the river itself, then merely a small stream, 50 feet in breadth (though it is fully 100 yards wide here, when in flood), we passed up the other bank, into a succession of open spaces, called "campos," originally clearings and camps of Indians, who have retreated further into the wilds before the advance of the rubber collectors from the Acre. Each camp is oval in shape, and the larger ones are about 1000 yards long by 300 in breadth. These are evidently part of a stretch of tableland, situated on

the ridge, that forms the watershed between the rivers Iquiry and Rapirran. Crossing this, we descended into the valley of the latter, where we were greeted by a fury of wind and rain, so that, despite the protection of the forest, the ground, already soaked, was in a few moments flooded inches deep in water; leaves and small branches were tossed and driven in every direction; several trees, in our immediate vicinity, were torn up by the roots and flung across our path, which by now was a watercourse, down which we slithered and bumped as best we could, soaked and chilled to the marrow by icy-cold raindrops, which cut and lashed one's face like whips. At night we arrived at the Rapirran, having taken four days to cover the 30 miles from Capatara, during which time we had been obliged to leave in the forest some mule-loads of provisions as well as a small Canadian canoe, with which eight Bolivian soldiers had been struggling for six days in a vain endeavour to carry it across from the river Acre.

Here, on the line of the frontier, was established our station A, the position of which was determined very carefully, and from this point the course of the stream was explored and mapped up to its source. A track, 20 feet broad, was cut direct through the forest, and a rigorous theodolite traverse undertaken to carry our longitude from point to point. At first, direction was obtained by compass bearing, after initial exploration, but this method was found to be exceedingly slow and laborious, and we adopted the quicker plan of sending out a lightly equipped party, to locate the river, some distance ahead. Signals would then be exchanged by an arranged code of rifle-shots, and the cutting party, which had remained in camp, would blaze a track towards the advance section, after which the blazed track was widened and cleared and bridges built across streams and marshes, where necessary. The course of the river was then traversed by compass and checked on the theodolite traverse from camp to camp. In this way we progressed through the heart of the forest about 15 miles in thirty-five days, when we located the principal source of the river, where the water gushes from two holes in the side of a hill, to which we gave the name "Ojos del Rapirran" (eyes of the Rapirran). At this important point in the boundary-line, a large permanent mark of iron was erected.

By this time, the end of August, the Brazilian Commission had decided that the work had progressed sufficiently, and when I suggested that we should carry our exploration into the region of the rivers Xipamanu and Ina, they politely but firmly refused to entertain the idea, pointing out that we had neither time nor provisions for any attempt to locate these rivers. I therefore decided to go without them, so, whilst the main body of the commission proceeded to the river Iquiry, Mr. Wilson and I, with two Bolivian soldiers and my Indian servant, started across the ridge that forms the watershed between the Rapirran and Abuna, and, descending into the valley of the latter, followed it to the westward, until we arrived at the junction of three rivers, where the Abuna begins, being made up by the confluence of the two rivers, Karamanu and Xipamanu. Fixing this point

by observation, we followed the latter river, as best we could, from information we were able to pick up from the inmates of isolated barracas, until we crossed it at Maloca, where we were able to get some fresh food. Crossing the forest to the southward, until we reached the banks of the Karamanu, and then striking north-westward again, after three days' wandering the Ina was located, and the position of its confluence with the Xipamanu determined. Returning by way of Maloca, our small party then traversed the country north of the Xipamanu until in the assumed latitude of the Iquiry, and then cut its way due east through the forest until we emerged into some Indian camps at Catùaba and Fazenda. The Indians here were by no means pleased to see us; my servant essayed to speak to them, but failed to make them understand. They did not actually molest us, but we were escorted to the edge of the clearing, and a path pointed out to us, down which we were pleased enough to pass on. I believe the language they spoke was Guarani, but I could gather no reliable information about them. The Iquiry was reached shortly afterwards, and we were welcomed as if we had returned from the grave. The last few days we had been without food, and each one of us had fever. Our two soldiers were down at once with malarial pneumonia, and although they were shortly afterwards sent to Riberalta, they never recovered and died two months afterwards. Mr. Wilson and I soon picked up, and the exploration of the Iquiry, and the determination of its principal source, were then taken in hand, and the work for the year brought to a close.

At the sources of the river Iquiry or Iluay we were able to get into touch with the chiefs of a neighbouring group of Indians. The chiefs indicated to us the source of the stream which they and their fathers had always known as the Iquiry, and the Commission accepted this stream and source as the main stream. As this differs from the one shown by Major Fawcett, it may be interesting to place on record the names given by the chiefs to the five branches into which the main stream of the Iquiry breaks up. Each stream was traced to its source.

1. Caraxirirran, the stream of the "caraxiri" tree.
2. Uassanarran, ,, ,, "uassaná" palm.
3. Quinbaquirran, ,, ,, "quinbaqiri" tree, known to us as the "bananeira" or fruitless banana tree.
4. Quinirirran, the stream of the "quiniri" palm, known to us as the "buriti" or "muriti" palm.
5. Iquiry, the river of love.

It is noticeable that the Iquiry is the only name containing the termination "ry" or "iry," which means "river," while all the others are terminated by "ran," which is the Indian equivalent to the Brazilian "igaripé," the Bolivian "arroyo," and our own word "stream." It is interesting in this connection to notice that the terminations "iry," "iny," and "ry" are found in the northern rivers—Iquiry, Acre (Aquiry formerly),

Xapury, Pauhiny, Tauhiny, etc., whereas a little further south we find the termination "manu" = water or river, viz.—

Xipamanu = long river according to our information, though General Pando informs me that in his first expedition there in the nineties the derivation was explained to him as being "Tripamanu"—the river of the "tripa" palm trees.

Karamanu = evil river, from Kara = disgrace.

Maimanu, Tahuamanu } derivation unknown.

In May of next year (1912) work was commenced at Cobija, and the Commission traversed and mapped the frontier line of the river Acre from Cobija to Tacna. The water in the river was unusually low, and the work of dragging our laden canoes over the sandbanks and snags was arduous in the extreme. Progress, against stream, was at the rate of from 8 to 10 miles a day, and only the five smallest of our canoes arrived at Tacna. During our journey we passed several river steamers, high and dry on the sandbanks, where they had been left by the fall of the water. The bed of the river Acre above Sacada is literally strewn with snags, stumps of trees, etc., and in several places the river breaks into "cachuelas" or rapids, which, however, are easily passed by lightly laden canoes. At Tacna, where the three countries of Bolivia, Brazil, and Peru touch, permanent boundary-marks were erected, and the Commission returned to Cobija. During the traverse astronomical observations were taken nightly for time and latitude.

After erecting the permanent marks at Cobija, the party passed into the forest, to the source of the Arroyo Bahia. The first part of this journey was along the excellent motor road, which has been cut and made through the forest between the Acre and the Tahuamanu, and is a monument to the zeal and energy of the firm of Suarez. The Bahia was explored, and, having obtained thirteen mules from Porvenir, the expedition started for the rivers Ina and Xipamanu. General Pando had, in 1911, caused a track to be blazed across to the source of the Ina, and our cavalcade followed it. At first disaster dogged our footsteps; the mules were wild and unmanageable, and broke away at every check—we had but two arrieros or muleteers to look after them—and our soldiers were most of them new and unused to forest travel. The pack-animals were tormented by flies during the day and weakened by blood-sucking vampire bats at night, and were often stampeded at night, driven wild with terror, by the near presence of some one of the larger cats; their food was of a most limited description, being simply what they could pick in the forest. Our track took us across streams and marshes, up and down precipices, through bamboo thorn brakes, until the Ina was reached. After three days' rest here, our party traversed to the source of the Xipamanu and its tributary, the Serpa, and thence, by devious ways, sometimes along rubber tracks, at

others directly cutting through forest, we passed on through the country, south of the Xipamanu, until we reached the confluence of the Ina and Xipamanu, and thus joined up our survey work of 1911–12. Here we overtook our own exploratory parties, which had been sent out in May to traverse by compass the courses of the two rivers. Mr. Fisher was so ill that he had to be sent home from there, Dr. Walker taking charge of him, for a canoe journey of 700 miles, down the river Abuna, to the Madeira Mamoré railway. During this journey Dr. Walker made a rough traverse of the river and gathered information that will be of great use to us in our future work on the Abuna.

From the confluence of the Ina and Xipamanu, one party proceeded down river to the Rapirran and completed its traverse from Station A (1911), to its junction with the Abuna; while the main party traversed the country, between the rivers Acre and Ina, and eventually returned to the camp at the Arroyo Bahia, thus completing a journey of some four or five hundred miles through the forest. We had been away thirty-five days, and men and mules staggered into camp in a pitiable plight, our exhaustion being almost complete. But a series of observation points had been fixed astronomically, which in conjunction with our work of 1911 and the compass traverses, has enabled us to prepare a fairly comprehensive map of the country between the sources of the Bahia and Rapirran, a region hitherto unmapped and geographically unknown.

The exploration of the Arroyos Bahia and Floresta was soon finished, and the commission returned to Cobija, and thence to Manaos, voyaging 1500 miles down river in our own little motor boat, 30 feet in length. We arrived in England in November to prepare for the work of the present year.

The general level of the country through which we passed is about 1000 feet above the sea and is all forest land. The soil may be described as being generally sandy in character, and of extraordinary fertility. In the valleys of the Rapirran and Iquiry, we met with no rocks, but the former river has its source issuing from a hill of ironstone, and everywhere to the westward we came across outcrops of ironstone. In the river Acre a similar stone is found, as well as iron pyrites, and on one of the "playas" of the river Purus we found some most peculiar springs, which had the appearance of discharging liquid plumbago, but Mr. Howe, the curator of the Jermyn Street Museum, informs me that the specimens, taken from these wells and submitted to him, are also iron bearing. The Acre is not a rocky river, although in many cases the hard brownish-red clay formations wear the appearance of rock. The formation of the Cachuelas or rapids appears to be always similar, viz. that of an outcrop from which the softer strata have been washed away on the lower side.

The lower Xipamanu passes through some magnificent gorges, and its river-bed and those of the Ina and Abuna differ in character from the river-beds of the more northern streams, the Acre, Purus, etc., inasmuch

as the three first-named rivers have muddy beds and banks, while the northern rivers are decidedly sandy with great "playas" or stretches of sandbanks, on which the Jacaré or alligator basks in the glowing sunlight, and in which the turtle lays its numerous eggs.

The annual rise of the rivers commences about the middle of October, and they are at their highest in January, after which a gradual fall is experienced, until in June, only canoe navigation is possible, and in many places, loaded canoes pass with difficulty. The Acre rises 30 feet, the Iquiry, Rapirran, Ina and Xipamanu about 20 feet; all rise above their banks and flood the surrounding forests. During the fall of the rivers, "ripokettes," or temporary rises, of from 2 to 10 feet occur, which are interesting, as no definite cause can be assigned for them. The natives say that these rises are due to rain, but, although recognizing direct rainfall as a secondary influence, I am of opinion that they must be in some way connected with the periodic melting of Andean snows. At first sight this is not apparent, for not one of the rivers has its source as far west as the Andean slopes. My suggestion, therefore, is that the feed-springs of these rivers, the Acre, the Xapury, the Jurua, the Purus, etc., are themselves the valves or outlets of subterranean rivers, that draw their waters from the melting Andean snows, or the "cloud bursts" which, I believe, are of frequent occurrence on the eastern Andean slopes.

Usually, the last big "ripoquette" takes place towards the end of May (in 1912 it was the end of June), and is given the name of "mata-feijẽo," or the "beankiller," as it sweeps away the young bean plants which at that time are well above ground. In March and April, as the waters fall the natives clear away all vegetation from the sandy banks and playas of the rivers, and plant beans thereon; and great hardship and loss result to them should the "mata-feijẽo" be of unusual strength. This bean sowing is practically the only general agricultural process in operation, though in the vicinity of the townships of Empreza, Xapury, and Cobija, and at some of the large depôts on the Acre, settlers are cultivating sugar-cane, coffee, mandioca (from which they make flour, and a spirituous liquor something like gin), macaxera, maize, yams, pineapples, oranges, mangabas, and papaia or mamão. Yet the soil is wonderfully fertile, and with very little toil, returns a harvest out of all proportion. The Government of Bolivia is pursuing the wise policy of making small grants of land near Cobija to time-expired soldiers, and thus is building up a type of colonist, attached to the land, with local interests and aims. Brazil will, no doubt, follow suit, and the day may not be far distant when these remote regions will supply their own population with the immediate necessities of life, instead of being, as at present, dependent on supplies brought up, at enormous freight charges, by river steamers from Manaos and Para.

In the forest, and on the smaller rivers, life is made almost unbearable by insect pests. Ants are met with everywhere; they swarm over one's person in hundreds, and most of them bite most savagely. There is one

kind of red ant, called Itashi, which lives in trees named palosantos, hollowed out by themselves, whose bite is like a touch with a red-hot iron. If a person inadvertently touches, or leans up against, one of these palosantos, the ants swarm out upon him instantly, and his life for hours afterwards is a long-drawn-out misery. Then there are the huge ants, called tucanderas, 1½ inches in length; they live in the forks of trees, though we frequently encountered them on the ground and also in our tents; their bite is particularly painful, and causes the part affected to swell up as if poisoned. One of our soldiers was incapacitated for several days by the bite of a tucandera. Red ants; black ants which make broad, straight roads of their own, and move about in battalions, with flanking parties and scouts; greyish-white ants, living in red-coloured mounds, 6 feet high; yellow ants, whose dwelling-place is in rotten wood—each and every one has its own particular way of making unwelcome the intruder into its habitat. Butterflies—the word does not seem to indicate any discomfort, but there is, in the region of the palm and bananeira patches of the Rapirran, a small brown variety, which, during the hours of bright sunshine, would settle on our persons and the instruments we were using in such numbers, and with such persistence, that survey work became an impossibility. By night, mosquitoes, fever-bearing and otherwise, but all irritating, winged ants of large size, and myriads of other flies, worry the explorer; by day, the pium, a small black fly, in appearance like a speck of dust, whose bite raises a little red vesicle; a fly, whose name I have forgotten, with a square body, which bites as he settles on one; the matoucha, of many varieties, each with its little sword-lance and blood-sucking apparatus, all on the look-out for warm animal blood. Wasps of many variegated colours, but always with a sting; hornets, which give no mercy to man or beast; bees of all sizes, some of whom swarm in one's shirt, eyes, hair, ears, mouth, and nostrils, seeking moisture. Every blade of grass has a tick, of some sort, waiting opportunity to bury itself in some one's flesh. It is impossible to protect one's self against, or keep out, the muquim, a microscopic tick, whose sojourn on one's body causes a most tantalizing itch, alleviated only by sponging the skin night and morning with alcohol of some sort. There are flies, too, which deposit their eggs in one's flesh, or in one's clothes which, after washing, have been stretched on the bushes to dry. Warmth from the body hatches out a brood of maggots, and a very unpleasant carbuncle or ulcer results. We treated these "bichus," as the natives call them, by applying cotton-wool, saturated with chloroform, to the ulcer as it approached maturity. The "bichu" dies and shrivels up, and can then be removed carefully. The natives treat them with tobacco-juice, or nicotine, from a foul pipe. Vampire bats come out into the open spaces at dusk, and mules are particularly liable to attack from these blood-suckers, which fasten on the animal's throat, and, by fanning with their wings, lull their victims during their meal. Our animals suffered much from these creatures, it being no

uncommon sight to see their throats covered with blood at dawn. Men are liable to be attacked by them, the part chosen being the great toe, and the natives keep a lamp burning all night in their huts as a protection against attack.

Snakes are common enough in the forest itself, and in the streams, but though we killed one or two nearly every day, no one was bitten. In the region of the Rapirran the "coral," one of the most beautiful and also one of the most deadly species, abounds; so do the jararaca and jaquiraboya, both deadly, the former of which is known by the name of the lazy snake, from its indolence and obstinacy. It stretches itself in the sun, and refuses to move for anything short of actual prodding. Mr. Wilson saw one of our soldiers leap over one, which struck slowly at him as he leapt, but missed. The man cut a stick, turned back and killed the snake, which did not make any attempt at flight. We found several that had been roasted to death, when we were making clearings for our camps, and our Indian soldiers assured us that these snakes prefer to die rather than move out of the way of the fire. Green grass snakes, the yellow papauva or egg snake, and little bronze snakes, about 2 feet long, are very frequently met with, the former in grass patches, and the latter among the dry leaves, that are spread all over the ground, like a carpet.

In the trees that overhang the rivers, we often met with a black variety, some 5 or 6 feet in length, which was probably a boa of some sort. The Sucuruju, Sucuru, or anaconda, haunts the backwaters and swamps, and its weird cry adds terror to the darkness of the forest night. We killed several small ones, and, during our traverse of the river Ina, I saw a large one, at the mouth of an igaripé, which, I think, was between 20 and 30 feet long. Their traces are often seen, in the region of swamp and backwater, and are occasionally large enough to warrant some of the stories of monster serpents current among the natives.

Spiders, horrid hairy creatures, with bodies 6 inches long, are sometimes met. One of our men was stung or bitten by one of these when out shooting; his foot, where he was bitten, became very inflamed and broke out into raw patches. He had to be left behind, as we were on the march, and when we sent for him three weeks later he was still limping.

The forest animals, with the exception of monkeys, whose name is legion, are rarely seen, unless sought, for a man, passing carelessly through forest, makes noise enough to warn every animal within hearing radius, and one hears much farther than it is possible to see. The Cotia, a sort of tailless rat-rabbit with long hind legs and brown body, and the paca, a five-clawed rodent, are plentiful, and the flesh of both is excellent eating. Capivaris, peccaries and cachada (porco de monte), all species of wild pig, are to be found by the hunter, as are tatous (armadillos) and anteaters and many kinds of venados (deer). Capivaris and venados are often met with on the river-banks, in the early dawn and afternoon. We shot otters in the Rapirran, in which, though a small stream, they were fairly numerous.

There are many species of maracaja (tiger cat), which, if caught young, become very tame and playful. Of the larger cats, the onçe (jaguar), puma, and black panther may be met anywhere in the forest. Major Goncales, our Bolivian officer in charge of the soldiers, was attacked, in broad daylight, by a large onçe on the beaten track near Capatara. He drove the brute off with his revolver, but the mule he was riding was severely clawed. One of our bullocks was killed by an onçe within 200 yards of our camp on the Rapirran. Mr. Atkinson on one occasion and Mr. Gibbs on another, encountered a large onçe almost face to face, and each time they were unarmed. Mr. Wilson and I, during our first journey to the Ina, chased a black panther away from his kill. We had only sixteen-bore shot guns, so did not manage to secure the beast, and probably it was fortunate for us that we did not severely wound it, as these black onces are greatly dreaded. I was told that only the female of the species is black, the male being brownish-red in colour, but I cannot vouch for this. But of all animals in these forests, the anta (tapir) is the most difficult to meet; his spoor is met with everywhere along the banks of the remoter streams, and his short, shrill whistle is nightly heard, but, follow his tracks as you will, and they are large enough and plain enough to see, it seems impossible to locate him. In all my wanderings through these forests, I have seen only two wild antas, and both of these were from a canoe, when coming down the Xipamanu.

Of birds there is an abundance, and most of those we shot found their way into the cooking-pot. Mutum, jacumy, and inambu are as fine game as our pheasants and partridges. At the source of the Rapirran, our guns provided us a very welcome addition to our table in the shape of a species of wild turkey, which we met in no other place. Toucans, with weirdly coloured gigantic beaks, parrots of various kinds, araras or macaws, jacu, hawks, and a multitude of small birds are common in the forest. Wood pigeons and doves coo continually on the branches of the higher trees, and the tap, tap, tap, tap of the carpentero, or woodpecker, is always to be heard. Humming-birds flit from flower to flower in the open spaces, and near the isolated barracas or huts of the Seringeiros. Along the river-banks the cigana, a sort of pheasant generally known as the stinking pheasant, is very common; so is a beautiful blue bird with white-tipped wings. Kingfishers, some as large as a pigeon, others as small as a wren, but all most beautifully plumaged; ducks, tern, and waders of all sorts, spur-winged plovers, marabou and maquary storks are plentiful; and in the "Purus" we shot some alenquorns or unicorns, birds as big as a large turkey, with three hard spurs on each wing, and a horn of hard substance sticking out 4 or 5 inches from their foreheads. I believe these are some sort of turkey buzzard, but our Indians regarded them as carrion. Mention, too, must be made of the "urubu" and "urubutinga," the scavenger of the forest-land rivers, that picks all carrion to the bone, and is immune from the tax of death, so hardly levied by man on all fur and feather.

Some of the rivers teem with fish. In the Xipamanu it was only necessary to bait a hook with anything edible or bright and drop it in the water, and it was taken immediately. It was unsafe to trail one's hand in the water for fear of the bloodthirsty fish called perania. General Pando had the top of his thumb severely bitten by one of these fish whilst fishing. The electric eel is met with in backwaters, lakes, and muddy rivers; so are tartarugas (turtles), and all sorts of fish of the catfish tribe. Stinging rays are plentiful, and are a source of continual danger in the traverse of the rivers, where it is necessary to be frequently in the water, dragging one's canoe over the sandbanks; and the jacaré (crocodile or alligator) infests every river and stream, even at their very sources. Some of these jacaré are very large—at least 25 feet in length—and others quite small. Coming down the Purus, we saw a large stag take the water and proceed to swim across. He had not swum 30 paces when he was seized by a large crocodile, whose jaws took him fairly in the barrel of the body, and in five seconds he was under water. We hoped to shoot that stag, but he disappeared before we could get our rifles to our shoulders. Many persons, especially women and children, are taken by jacaré every year. Some of the smaller yellow-coloured ones, called jacarétinga, are edible, the tail portion being very good indeed. On our journey down river in our little motor boat, we were reduced to hunting for jacarétinga on the sandbanks about midnight, and eating them for breakfast in the morning. Hunger—real, naked hunger—is an excellent sauce, and the explorer and voyager, in these out-of-the-way parts, has often a plentiful supply of it to add relish to the peculiar dishes to which he is reduced. Monkey, once (leopard), fox, tiger cat, rat, snake, and crocodile have all figured on our bill of fare, whilst palm-tops and some species of grasses are by no means to be despised in lieu of vegetables.

In the forest we very frequently came across numbers of little hollow constructions of clay, which I think must be air shafts or chimneys of some sort; usually they are of brick-coloured clay, quite brittle, and stand 4 or 5 inches above the ground, being about 2 inches in circumference. When broken off, close to the ground, one could see that they led into a sort of tunnel or shaft, but we never succeeded in locating or sighting their builder or occupant. One of my Indian soldiers told me that they are built by a large worm (or small snake) without any eyes, but I give this for what it is worth.

Of the forest itself fifty books might be written. In a short paper no justice can be done to the subject; one can but mention its magnificent wealth of fernery, lianas, cipos, and all kinds of creepers, its flowering trees glowing with colour, its patches of odour-laden plants perfuming the air with intoxicating scents. One may draw attention to its stores of ironwood, cedar, bacury, laurels, itambu, also called stonewood, which is reputed to resist decay for ever, the red-wooded sabucaia, and the sabauma; to its palms of all kinds, from one of which the delectable purple drink

known as assai is made; from another, the biriti or miriti tea; while yet another bears a most delicately flavoured and delicious diminutive coconut no larger than a walnut. There are silk cottonwood trees, 200 feet high and 30 feet in girth above their buttresses, which are 20 feet high and stretch 100 feet above ground from the trunk, giving space for a house to be built between buttress and buttress; rivals of these are still larger castaneiras, whose fruit is the Brazil nut, with trunks, which six men with outstretched arms, touching finger-tip to finger-tip, can hardly span, and with stems that stretch upwards straight as a die for 150 feet, and then branch out into a huge domelike crest, under which the ordinary forest trees grow unhindered. A peculiar tree is the "arbole de chuvia" or rain tree, from the upper leaves of which descends a continual shower of drops of moisture, so much so, that even in the driest weather the ground underneath is soaked and sodden. Its bark is corrugated like cork and easily broken off. Then there is the massaranduba or cow-tree, which gives out a thin white milk sweet and pleasant to the taste and good to drink. And always and everywhere the seringa, the rubber-tree, for this region is wonderfully rich in rubber, the ouro-preta or black-gold of Brazil, Peru and Bolivia, and its collectors, the seringeiros as they are called, penetrate into the remotest recesses of the forest in their search for untapped trees.

The country through which we passed cannot be looked upon as inhabited, though most of it has been more or less parcelled out into "seringals" or rubber concessions, and it is gradually being exploited in the interests of the rubber industry. The boundaries of these "seringals" are often ill-defined and overlapping, and feuds and struggles for possession of "strada" are of frequent occurrence between the seringeiros of adjoining estates.

The banks of the river Acre are dotted with rubber depôts, usually consisting of a store, rubber shed, and a few barracas or huts, erected in a clearing, and from these depôts long straight "varadors" or mule roads are cut through the forest, as far back as the limits of the seringal extend. Indian paths and "strada" or rubber paths, along which a man, but not a mule, may pass, form a network between the varadors, without, however, directly communicating. Away from the Acre depôts but on the varadors are the "centros," or distributing and collecting centres, which are always in touch, by means of mule transport, with the depôts, and away from the "centros," in the depths of the forest, are the isolated barracas of the actual rubber collector.

The life of a working seringeiro is a particularly hard one. He often lives alone, or with one companion, in a rough hut or barraca, built of lathes made from a species of palm, and roofed with the leaves and fibres of another. After having located his "seringas" or rubber trees, he cuts paths from tree to tree. His day commences shortly after 4 a.m., when he rises, drinks a cup of coffee, shoulders his rifle, and taking his small axe and some little tin cups, he starts out on his morning round,

visiting each tree in turn, making incisions in their bark, and fixing a little tin cup to catch the white milk that flows therefrom. After all his trees have been visited, he returns to his hut, cooks and eats his mid-day meal of xarque (dried meat) and beans, and at once, if he is alone, starts out to collect the milk from each little tin cup. Returning home, he lights the furnace in his rubber hut, the atmosphere of which, after five minutes, is stifling, pours the milk into a large pan, and slowly heats it; when hot enough he proceeds to smoke-dry it on to his rubber ball, which is mounted on a long pole or stick, by pouring it over the ball, which is held in the smoke of the furnace, and must be kept revolving. A special kind of fuel must be used in this operation, and this he must collect beforehand. By the time he has dried all his milk it is dark; he eats his supper and goes to bed. Day in, day out, this is his life, varied, only too certainly, by attacks of fever and rheumatism, and by bouts of ptomaine poisoning caused by bad food. Occasionally he shoots some animal or bird of some sort; but this is his only fresh food. Ill-nourished, hard worked in a fever-haunted country, it is small wonder that the mortality amongst them is very high, and every little isolated barraca has its own little cemetery, in which one nearly always sees a newly made grave. Most of the working seringeiros are Cearense (from Ceara), but one meets half-breeds and mixtures of all kinds, full-blooded negroes from Pernambuco, and indeed Brazilians of all types. Some Indians we met, but they are rare, and though Indian blood is very apparent in many of the dwellers of the region, the only groups of uncivilized Indians we met were at the Campos of Fazenda and Catuaba.

It is sacrilege to lay violent hands on the rubber-tree, and in the seringals or rubber estates questions of poaching are settled out of hand with the rifle, usually without time being allowed for personal explanation. But though in our wanderings we have encountered many a seringeiro, though we have camped with them, worked with them and eaten with them, we have never had to record a rude word, but have been welcomed frankly and given all information and assistance that lay in their power to give. Yet amongst themselves they are lawless in the extreme, especially in the remoter regions, away from the Acre depôts, recognizing no authority, prone to quarrel and settle their disputes with knife or rifle, especially during their drinking-bouts. "Government? What is that? We know no government here," was the reply given to me by a man with whom I was endeavouring to arrange the hire of a canoe. Yet he lent the canoe and paddled it down river himself as a personal favour to me. Needless to add he accepted a very handsome present, also as a personal favour, though one has to be exceedingly careful in the manner of offering money in repayment of hospitality and services rendered.

On the accompanying map is a detailed list of observation points on which the map is based. I hope, by the end of the present year, to be able to extend this map as far as Villa Bella on the river Mamore, thus

completing the whole of the northern frontier line between Bolivia and Brazil.

Major L. DARWIN (Vice-President, in the chair): Lieut. Edwards, our lecturer of to-night, is a member of the Nigerian Civil Service, from which service he obtained three years' leave of absence in order to take part in the Bolivia-Brazil boundary commission, having received the appointment of technical commissioner under the Bolivian Government. I think any one, both in taking part in such work and in describing it, has a great advantage if he has seen many other parts of the world. Lieut. Edwards has had a wide experience, not only in Nigeria, but also in many other parts of the world, and therefore I am quite sure we shall listen with interest to any remarks he may make on the interesting regions he has had to traverse.

H. E. Colonel SUAREZ (after the paper): Unfortunately, I have not had time to prepare anything for to-night. I must begin by thanking Lieut. Edwards for the splendid paper he has just given us on that region, which I see from the photographs is far more civilized than it was when I passed through it twenty-five years ago. At the time I only met savage tribes, but I must say they were very kind and hospitable. Everything Lieut. Edwards has told you about the insects and so on is quite true. I had to pass through that region, and I had to suffer for it. With regard to the motor road, I can tell you it cost £80,000 to build that road. Every year it has almost to be rebuilt again, and £8000 to £10,000 is the cost of it, but it renders very useful service to the owners of the road and the people. I may give you a little idea about that region. Up to the year 1867 Bolivia owned up to Crato, which is on the Madera river as far as big ocean steamers could go, but unfortunately a very clever Brazilian diplomat induced General Melgarejo to sell that territory to Brazil. Since then we have been trying to have the boundary marked, but we always met with difficulties on the part of Brazil. In 1895 General Pando went up there with a Brazilian Commission. They fixed a line, and the Bolivian Government established a custom house, and installed the necessary authorities at Porto Alonso. The Governor of Amazonas, residing at Manaos, who lost the revenue of the Acre and Purus territory belonging to Bolivia, induced the Brazilian inhabitants to rise, declaring an independent territory, with the idea of annexing it later on. Bolivia had to send troops overland through dense forests without proper roads at a great cost, and by the time the troops got there they were not in a fit state for fighting, owing to their long march of over three months. As the Brazilian Government did not try to stop the filibuster's expeditions that were continually starting from Manaos and now and then from Pará, General Pando, who was then President, resolved to run the risk of a war with Brazil, and mobilized the army, marching himself at the head of the troops. When he arrived at the Brazilian frontier on the Acre, the Brazilian Government proposed an exchange of territory and a payment of £2,000,000 indemnity, which the Bolivian Government accepted, and thus the Treaty of Petropolis of 1903 was signed. In 1907 Colonel Fawcett, then only Major Fawcett, was sent at the head of the Bolivian Commission to try and mark the boundaries, together with a Brazilian Commission, but he met with the same difficulties as Lieut. Edwards, that is, that the Brazilian Commission will only do a certain amount of work every year. Colonel Fawcett worked for two or three years, and then, as his services were required in another part of the country, Lieut. Edwards was engaged, and he started as chief technical officer of the Commission, of which General Pando was the head, returning again last year, as he has informed you,

accompanied by Mr. Fisher, Mr. Wilson, Mr. Atkinson, Dr. Walker, and Mr. Gibbs. All these gentlemen have done splendid work, but unfortunately Mr. Fisher, owing to a severe illness and loss of memory, will be unable to join this year's expedition, which will start some time in the month of June, and we hope that Lieut. Edwards will be able to induce the Brazilian Commission to push on with the work this year.

I have to express my thanks once more to Dr. Keltie for having recommended me such excellent men as Colonel Fawcett, Lieut. Edwards, and their companions, and also to thank Lieut. Edwards again for the lecture he has just given us.

Prof. ISAIAH BOWMAN: It is a very great pleasure to attend a meeting of this distinguished Society on my way to South America for the third time. The region I have visited does not correspond with any of the territory covered by Lieut. Edwards, and I am afraid I cannot throw much light on the region he has so well described. The Peruvian Commission had completed part of its work and returned to Lima in 1911, and there I met Captain Toppin, of that Commission, It was, therefore, with double pleasure that I accepted an invitation to come here to-night and hear something about the Bolivian Commission which had been carrying on work on the other side, further east. I quite sympathize with the speaker's remark about your amusement at his stories of insect life. Between the speaker and his audience on such an occasion as this there is a certain good feeling, which is very pleasant to the speaker, but afterwards, when he is alone with his friends, they want to know exactly what the facts are—they want the true story! It is quite impossible, under the civilized circumstances under which we meet here, to appreciate the insect life of the tropics, and to what an extent insects torment people and animals, and weaken their strength and powers of resistance to disease. The audience, under such circumstances, is always interesting to watch, and from my privileged seat here I looked into the faces of a large number, on which there were incredulous smiles. The speaker might have made his story about the ants a little larger. As a matter of fact, the observations of a number of physicians have shown that the bites of a large number of these ants is almost always followed by a severe fever, lasting in some cases for five or six hours; and to any one who has leaned up against the palosanto tree, and has been bitten, it is an experience never to be forgotten. I am glad of the explanation concerning the extraordinary rise and fall of certain streams, and its apparent lack of relation to even local rainfall. I want to offer one suggestion. We have to remember that thunder-storms may have a distinctly local character. Nevertheless, the actual rainfall is often very much more localized than are the clouds involved in the storm; so while a large area may be clouded, a heavy rainfall may occur in a very much more limited area, and as a consequence neighbouring streams may have very great differences in height of water. There is one observation I have made in the eastern valleys of the Andes that may throw some light on the conditions of stream-flow to which Lieut. Edwards has referred. For example, down the Chaparé valley one may see on either hand a large extent of sandstone which is cut away in steep cliffs and valley slopes that overlook the river. For many miles down that valley one may see water oozing out of the sandstone at such a rate that it is gathered into small rivulets and collected at the foot of the slopes into definite tributaries, though these tributaries, entering as streams 8 or 10 feet in width, may be no more than a few hundred feet long. I have seen nowhere else such extraordinary conditions, nor have I read of similar conditions elsewhere. It is true of a very considerable belt of sandstone which occurs along the eastern border of the mountains. We have only to think of this sandstone receiving rainfall and discharging it some days after when the rainstorm has passed, to see

sufficient cause for the rise of the stream. Some of it is taken in by the porous rock, and given out days later when the weather may be quite clear—given out at such an increase over the normal rate that the streams which flow through the region rise in consequence. I wish to add that I have had great pleasure in listening to Lieut. Edwards's excellent paper on Eastern Bolivia.

Mr. BURGESS made a few remarks.

Major DARWIN: In thanking the lecturer for his interesting lecture, I cannot help recalling the fact that he took part of his instruction in surveying under the auspices of the Royal Geographical Society, and took our diploma. I think any one will recognize that the work was exceedingly troublesome, and that the modesty of his account has concealed a great number of difficulties he had to face. His description of the country was on the whole a vivid one, and made one feel that the scenes he saw were ones of great beauty. We shall all remember, not only the modesty of his description of the work done, but also the generosity with which he mentioned the difficult journeys of Dr. Walker when taking Mr. Fisher down to the coast. I am sure I may thank him in your name most sincerely for his excellent lecture.

ACROSS SOUTHERN JUBALAND TO THE LORIAN SWAMP.*

By I. N. DRACOPOLI, F.R.G.S.

THE immediate object of the journey across Jubaland, from which I have just returned, was to elucidate, if possible, the much-disputed question of the disappearance of the river Uaso Nyiro in the Lorian swamp; to investigate the country through which the Lak Dera runs, the eastern portion of which had not been previously visited by a white man; and to map as much as possible of that huge stretch of unexplored land lying between the Lak Dera and Tana rivers, which is known under the names of Southern Jubaland and Northern Tanaland.

Traders, big-game hunters, and political officers have from time to time made their way into the western part of the Lorian district, and their accounts have differed widely from each other. Colonel Broun brought back, however, a very excellent map of the country he traversed; but, like the others, lack of food prevented him from penetrating further eastward than the western extremity of the main swamp. Similarly Mr. Haywood, who made a very interesting journey from Afmadu to Wajheir and thence southwards to the Lorian, was compelled to press onwards, having little or no food left for his men. Profiting by their experience, I gave up the idea of reaching the Lorian by way of Nairobi and the river Uaso Nyiro, and decided to start from the coast and approach it from the east. This journey has been attempted once before, but ended in disaster. Mr. Jenner, then Provincial Commissioner for Jubaland, left the coast some years ago with the intention of reaching Lorian. He arrived at Afmadu, and passed

* Royal Geographical Society, June 9, 1913. Map, p. 224.

on westwards, when he was attacked one night near Liboyi by Mohammed Zubheir Somalis, and he and all his party were murdered with one exception. Since then, however, the natives have realized the value of trade and have become friendly, although the interior of Southern Jubaland is only nominally administered.

Leaving Mombasa therefore early in November last on a small steamboat, I reached Lamu the following evening. This interesting little town was known in very early days to Arab and Persian traders, and was famous until recently for the beautiful china and pottery manufactured there; but the inhabitants have ceased to make any more, for what reason I cannot say. From Lamu northwards, almost to Kismayu, ruins of ancient mosques and stone houses of unmistakably Persian design are to be found close to the shore, and on the numerous small islands that lie near the coast. Both the inhabitants of Lamu and the Bajun (who live on these islands) claim to be of Persian descent; and their light colouring, their regular type of feature, and the shape of their pottery seem to bear out their statements. The Bajun islands are of coral formation, covered with a low thorn scrub; on the landward side are mangrove swamps, and at low tide a great expanse of mud and sand is exposed, on which can be seen countless crabs and other animals. Ambergris is occasionally washed up on the shore, and at certain seasons all the inhabitants turn out every morning and scour the beach in search of this precious substance. An animal that is by no means uncommon in these waters is the dugong (*Halicore tabernaculi*), I am told that the flesh is white and is excellent to eat, superior to the best veal.

The day after I left Lamu I reached Kismayu, which is the seat of government for Jubaland. It consists of a few stone houses and a not inconsiderable number of native huts. Hides are the chief export at present, but when the Gosha country is more fully developed cotton and Indian corn will be shipped out in larger quantities. Here I was most hospitably entertained by Captain Salkeld, the Provincial Commissioner, and the Hon. K. R. Dundas; and they both most kindly helped me to obtain my camels and make my preparations for the long journey inland.

I was able to start some ten days later. My caravan consisted of eighteen camels and twenty-four men, including a small escort of native police. Captain Salkeld very kindly armed my men with rifles, as it was not known how friendly the natives were in the interior, and lent me ten large copper water-tanks, so essential to the traveller in Jubaland.

My first objective was the Sezera (El Lin) swamp, from which, according to the existing maps, the Lak Guran rose and flowed southward.

Behind Kismayu, and parallel to the coast as far south as Port Durnford, lies a low range of sand-dunes rarely exceeding 200 feet in height. They are covered with dense thorn scrub and flat-topped conifers (*Juniperis procera*). Beyond these hills the country is extremely flat, also covered with dense scrub, but opening out from time to time into little

park-like plains with a luxuriant growth of grass, and dotted with mimosa and camel thorn trees (*Acacia giraffæ*). It is here that the Somali bring their cattle to graze. During and for a short time after the rainy season there is a considerable amount of surface water in this district, and in places it becomes very swampy, the slope of the ground being insufficient to drain the country. To the south stretches the Dibayu plain, a perfectly level expanse of sandy soil clothed with coarse grass and low stunted bush. There was a certain amount of game here—Oryx beisa and gerenuk (*Lithocranius walleri*) being the most common. I also obtained quite a new subspecies of Grant's gazelle. Apparently Peter's gazelle, which I had expected to meet all up the coast, is not found much north of the Tana river.

I finally reached Sezera (El Lin), which proved to be a small swamp situated just south of the equator in a shallow depression, some 3 miles long by ½ mile broad. A small stream runs *northwards* from it into the Deshek Wama. As there is a very gradual slope (1 in 800) upwards towards the south, it was obvious that the Lak Guran did not rise here. As my guide told me it lay three days to the south-west, I turned in that direction in search of it. I was here delayed for ten days by a sharp attack of dysentery. This delay was all the more exasperating, as I was obliged to give my men their full ration of rice, since I was unable to shoot meat for them, and in this way much valuable food was consumed without any progress being made. However, as soon as I was well enough to march, I proceeded westward along a fairly good trail. After Gararu the dense monotonous thorn scrub gave place to forest equally dense, but more interesting. Huge yak trees with weirdly gnarled trunks, and slender mimosas, afforded welcome shade, while beneath them plants and shrubs, with beautifully coloured flowers, grew in astonishing profusion. Twelve miles north of the Lak Guran I reached the top of the main watershed that divides the valley of the Lak Dera from that of the Lak Guran (the "Jungle stream"). "Lak" is a Galla word for a river that runs only after the rains, and is universally used in Jubaland by the natives to distinguish such streams from the permanent rivers, for which the Somali word is "Webbe." Lak Guran (or Guranlagga) means "The stream where the bushes grow" (a thornless acacia).

I reached the river the following day at a place called Chimbirlé ("Pool of birds"). A dark line of trees rising high above the thorn scrub denotes the actual bed of the stream, whose general direction is west to east, a very different course to that marked on existing maps.

A month later I reached its source, which is situated in the district of Kurde, in lat. 0° 22′ 28″ S. When I was there, water was not running, but the natives state that after the rains it is often impassable for weeks. The channel varies from 10 yards to 150 yards in breadth, and is filled with the densest jungle, through which in most places it is impossible to make one's way at all.

Practically the whole district of Guranlagg is avoided by the Somalis, although it possesses some very rich pastureland, because of a certain kind of fly (probably *Tabanus africanus*) which infests its forests. They are said to cause fever among cattle and camels. My own camels suffered considerably here, and large fires of green wood had to be lighted, in the smoke of which they used to stand, refusing to feed, and obviously terribly tormented by these flies. I believe, however, that it is the irritation caused by the bites of these insects rather than any poison they carry which causes the fever.

After leaving the river, I proceeded southwards into the districts of Choré and Kurde. This country consists of a series of broad shallow valleys, almost imperceptible to the eye, for the most part overgrown with dense bush and forest, and generally running from the north-west to the south-east. Down their centre there are usually dry river-beds, mostly sandy and covered with almost impenetrable jungle. As they draw near the sea, these valleys and low rounded ridges disappear, giving place in the north to a level arid plain, which is only separated from the sea by the line of sandhills mentioned above. South-east of Choré is a belt of forest country known as Biskaya. Near the coast there are a large number of mangrove swamps infested with the tsetse fly. The greater part of the water that falls during the rainy season in this district drains into these swamps and into the river Durnford, and thence into the sea.

The scenery in Choré and Kurde is very striking; thick belts of dense acacia scrub alternating with most beautiful park-like glades, with ample pasturage for camels, cattle, and goats. But there are no permanent streams or water-holes, and during the dry months it is absolutely deserted, the cattle being driven either southwards toward the Tana, or northwards to the Deshek Wama. The largest and most important water-holes are Eylad, Chimbirlé, Gombe Barsa, and Jara. I saw many others, but they were small and not to be relied on except after an abundant rainy season.

At Jara water may be obtained by digging, and I found traces of three old wells, now fallen into disuse, and almost hidden by reeds. In the mud here I caught two fish, which I preserved and have brought back for identification. Mosquitoes (*Anopheles*) abound round these poles, but I saw no tsetse fly.

I spent some time here hunting that very local and very beautiful antelope, Hunter's hartebeeste (*Damaliscus hunteri*), and I was finally successful in obtaining three good specimens. Without exception they are some of the shyest animals I have hunted, and the country they live in adds greatly to the difficulty of their pursuit. There are two points in connection with them which I have not seen mentioned before. One is the extraordinary development of the facial glands, and the other is the presence of a large roll of loose skin situated immediately behind the horns, which, when the animals are in good condition, is filled with fat. The study of

the mammals of Jubaland cannot fail to interest the traveller, but it is impossible to go into the question here. I will only say that rhinoceros and buffalo are very scarce; elephants are not uncommon, while giraffe (*Giraffa reticulata*) are to be found in certain districts in truly astonishing numbers. Of the smaller game dikdik (*Madoqua kirki*) are common everywhere, gerenuk (*Lithocranius walleri*) and topi (*Damaliscus jimela*), plentiful in Choré and Kurde, though exceedingly small in bodily size and horn measurement; oryz beisa, Grant's gazelle, lesser kudu (*Strepsiceros imberbis*), zebra (*Equus b. granti*), and Hunter's hartebeeste are found in Choré, Kurde, and Dibayu, but are nowhere numerous.

In the first few days of January some severe thunderstorms occurred, rendering the atmosphere, already oppressive, almost intolerable. Moreover, the damp had a most disastrous effect on my provisions—one sack of rice and the rest of the potatoes had to be thrown away, while my flour became full of weevils. I could now no longer feel the north-east monsoon, which makes the temperature very pleasant on the coast; in its stead there was a fairly constant wind from the south-east during the middle of the day during the early part of January, but later, in Kurde and westward, it became very faint, scarcely a breath of air being felt in the bush.

I now turned almost due north, and made my way slowly into the district of Gulola. The country was still most extraordinarily level, but though much of it was covered with dense bush, parts were very lovely; there were many large acacia trees and conifers, which afforded pleasant camping-grounds, and there was an abundance of surface water. Here I met the chief of the Maghabul Somali, a small section of the great Ogaden tribe. The Jubaland Somali are a most interesting people; they claim descent from an Arab sheik who fled from his country and settled on the Benadir coast in about A.D. 1300; but there are to-day few pure-blooded Somalis, most of them having had intercourse with the Galla, who not many years ago occupied the whole of Jubaland. There was, and there still is, a steady migration of Somalis from the north towards the south and west; for example, the Marehan have but lately crossed the Juba, and it is only the Tana that has temporarily prevented the Abd Wak and the Abdullah from driving the Galla still further south. All these Somali are purely nomadic, and move from place to place according to the grazing and the water supply. They own vast herds of cattle, goats, and sheep, but in Southern Jubaland, although they possess a large number of camels, they do not breed them. Their huts, which are wretchedly poor and squalid in appearance, are built by placing six curved posts in the ground; the tops are tied together and on these are placed mats, skilfully woven out of grass by the women; a very small opening is left to allow the owners to come in and out, and for the smoke to escape. When they move, the mats are placed on the camel's back, and serve as pack saddles; three posts are tied on each side, and the rest of their household goods are fastened in

between, while little children, slung in sacks, and perhaps balanced on the other side by tiny lambs, complete the load. Water is carried in gourds, or in leather bags, made of giraffe hide. This skin is much prized by them, as from it they make their sandals, their round war shields, and the various utensils for holding water. The men carry, in addition to their shield, which is strapped to the left arm, a short broad-bladed spear, a short dagger with horn or wooden handle, a wooden pillow on their left wrist, and a "tooth stick." All these accoutrements, except the latter, are made by a certain class of dependants (Tomal), who do nothing else. They trade for the iron with the Arabs, and give in exchange cattle or ghee. The hunters carry in addition a bow and arrows, if they have no rifle; a little bag containing a powerful vegetable poison; a light stick, to the end of which is attached a tuft of marabout feathers for testing the wind, and a hollow stick about 2 feet long, for drinking water when it is situated, for instance, deep down amongst rocks or in the hollow of a tree-trunk. Among certain tribes a man is not allowed to marry until he has killed one of the tribe's enemies; when he has accomplished this, he has a black shaft put in his spear. This wood is very similar to ebony, and is found in many parts of Jubaland. The Somali are very clever at carving wood; some of the wooden pillows, ghee spoons, and hair-combs were very handsomely and elaborately decorated in this way.

Their chief food is milk and ghee. In addition they are very fond of rice when they can get it, and will do almost anything to obtain meat, except kill their own cattle. Being, according to their own ideas, strict Mussulmans, they do not touch any kind of alcohol, but they have another kind of drink, peculiar, I believe, to Jubaland, called "buni," or Somali coffee. It is prepared in the following manner: The coffee, consisting of the entire berry, is first fried in ghee; the latter is then poured off into a dish which is handed round to each man, beginning with the eldest. Each man dips his hand in and solemnly rubs his face, head or arms with the ghee according to his taste; meanwhile the berries are boiled in a little water, a good deal of sugar is added, of which they are inordinately fond; a little more ghee is poured in, and the resulting sickly mess is then drunk with the greatest relish, and the berries eaten. Before anything can be discussed, before any dance can be begun, or before any important decision can be taken, all present must partake of "buni." They claim that it possesses marvellous properties, that it relieves fatigue and pains of all sorts, clears the brain and makes "the heart glad." This coffee therefore formed one of the principal and most important items of my trade goods, and no traveller should attempt a journey into the interior of Jubaland without a plentiful supply of it.

The Jubaland Somali are extremely fond of singing and dancing, but they neither use nor possess any kind of musical instrument, not even the tom-tom, of which the Arabs are very fond. They have songs suitable for almost every occasion, many of them being of a religious nature.

Especially interesting are those sung when loading and unloading the camels, and the song of thanksgiving, when, after a long march, water is reached at last. The chorus sung by perhaps sixty or seventy men is very effective.

Their favourite dance is the war dance. Ten or twelve men, fully armed with spear, shield, and knife, and wearing their sandals, gather together round an ox-hide which is stretched in the centre of the dancing place. The rest of the spectators form a hollow square around them, while further back the women stand on the outermost edge of the ring. At a given signal the warriors begin singing and then dancing in a circle, at first slowly, but gradually faster and faster. From time to time one of them will rush towards their chief leaping high in the air, brandishing his spear and saluting, while the others all stamp together upon the ox-hide. They gradually work themselves into a perfect frenzy of excitement, the spectators join in the songs, keeping time by stamping on the hard ground, while above the uproar can be heard the thin shrill cries of the women, voicing their approval.

Chiefs of tribes are buried with some ceremony. Their followers build huge mounds of earth about 20 feet high above their graves, and they then surround it with a strongly built fence, made of logs of wood placed horizontally between heavy upright posts.

In Gulola there are two important water-holes, namely, Gama Gar and Gulola. The former, which is about 5 miles in circumference, is filled with elephant grass and surrounded by dense acacia bush, spiny euphorbias, and a few large conifers (*Junipenis procera*). A small stream runs into it from the west. The water, when I passed through it, was about 3 inches deep, and the ground very soft and boggy. To the north-west of Gama Gar, and situated just south of the equator, is Gulola. This pool is roughly circular in shape, and about 12 miles in circumference, and though surrounded by almost impenetrable jungle, the centre is open, and I should imagine very deep, as the bottom slopes sharply down from the edge of the swamp. After a plentiful rainy season, this pool lasts throughout the year, and would amply suffice to water several thousand head of cattle during that time. But it has been known to dry up with disastrous results to the Somali and their cattle, who were dependent on it.

As regards the Bisahu-Hamu, marked on almost every map as an important swamp, its name is unknown to the natives, but north of Bussa Berora there is a large plain covered with coarse grass that no doubt becomes swampy in the rainy season. Crossing the equator, I still continued northward, through dense jungle, until I reached Jeldez, a well-known water-hole on the old Galla trail between Afmadu and Lorian. This bush-path has been completely abandoned by the Somali, who prefer to travel along the north bank of the Lak Dera, where water-holes are more numerous and the country less inhospitable. Jeldez happened to be dry when I was there, but I was able to obtain water from a rain-pool I

had passed some 15 miles back, which a local thunderstorm had luckily filled. It was small in quantity and unpleasant in quality, but we were glad enough to get any. Jeldez itself is a circular depression, about 300 yards in diameter, and there is a well dug in the centre, about 12 feet deep. The soil is sandy, and the floor of the well was damp, but though I dug 3 feet deeper, no water could be obtained. It is surrounded on all sides by dense bush.

The next stage of my journey—that is, from Jeldez to Lorian—although only about 140 miles in all, proved by far the most difficult and the most arduous. No payment would induce my two guides to go any further, for they said that they did not know the country well, and that they would not be able to return without any camels, and these I could not spare. I gave the camels three days' rest here ; the pack-saddles, ropes, and girths were overhauled and repaired ; the loads were repacked, and everything that was not absolutely essential was abandoned. I left Jeldez about three in the afternoon, following the old trail, which here led towards the west, but it was much overgrown and very faint. About sunset we entered into the thickest belt of " wait-a-bit " thorn yet encountered. The short and strongly curved thorns played havoc with the loads, necessitating many exasperating delays and the loss of some rice and trade goods. About 2 a.m. I heard frogs croaking, and found two large water-holes, which are known to the natives under the name of " Roblé " (= pool of rainwater). One of them was partially filled with very foul water and covered with a quantity of water-lilies (*Nymphæa stellata*). I camped here a couple of days, in order to take observations for latitude and longitude, and then marched on westwards, reaching Liboyi the same evening. The latter place is a large circular depression filled with dense jungle, some 20 miles south-west of the junction of the Lak Aboloni and Lak Dera.

The country between Jeldez and Liboyi is arid in the extreme, covered with dense leafless thorn bush, and uninhabited owing to the scarcity of water and of grazing. Liboyi was dry when I arrived, and as the trail had now completely disappeared, I decided to march north-west in the hope of reaching the Lak Dera and the trail, which I had been told followed the northern bank. I had some difficulty here in persuading my men to go on, for they all wished to turn back, but my headman, himself a Mohammed Zubheir Somali, behaved splendidly, and finally overcame their fears. To the north of Liboyi are a series of small swamps from which a stream runs towards the north-east and finally joins the Lak Dera. I discovered later that it is known to the natives as the Lak Aboloni. There is a low rounded ridge between it and the Lak Dera which I crossed before descending into the valley, in which the latter runs. On each side of the Aboloni, and between it and Lak Dera, the country is very fertile, and the soil is probably alluvial and undoubtedly very rich, resembling the Lorian plains. But with this exception the districts of Arroga and Rama Gudi are extremely arid ; this vast expanse of low thorn scrub is uninhabited and

practically devoid of water, and, in my opinion, will never be of much value either for cattle or for farming. (Rama is a Somali word meaning "wilderness.") I now followed the course of the Lak Dera until Lorian was reached seven days later. For the greater part of that time we had to cut a way for the camels, and our progress was consequently very slow; moreover, the heat was intense, and tried both men and camels severely.

Before going on to describe the Lak Dera and Lorian, a few words as to the climate of Southern Jubaland may be of interest. Along the coast, with the exception of the period between the two monsoons, the weather, though hot, is not unpleasant, but in the interior the effect of the monsoon is soon lost and the heat becomes intense. The maximum temperature recorded was 116° Fahr. in the shade at Jeldez. During December, January, and February the mean daily maximum was 96°, and the mean daily minimum 83°, while the humidity was very great, rendering the atmosphere at all times heavy and oppressive. Whenever I was in camp for more than one day I took hourly readings of the barometer, which showed a very regular diurnal variation of about 0·09 inch between the maximum and minimum readings; but I noticed no daily recurring form of clouds or other exceptional meteorological phenomena.

On the whole I consider the climate in the interior distinctly unhealthy. Of the twenty-four men in my safari only three escaped an attack of malarial fever. In addition, I had nine cases of dysentery and one of heat prostration. The average number of cases treated per day throughout the journey was three—a very high percentage.

We now come to the consideration of the Uaso Nyiro, Lorian, and of the Lak Dera. Although this large tract of country embraces a great variety of climate and physical features, yet it is best dealt with as a whole, since it treats of a single important river system. I should like to emphasize the fact that the river-bed is continuous from the source of the Uaso Nyiro to Afmadu, since this was not known hitherto. The well-known river that rises in the high mountainous country to the north-west of Mount Kenya is known to the natives as the Uaso Nyiro from the junction of the Uaso Narok and the Ngare Nyuki until the remarkable volcanic plateau, called Marti, is reached. Thence, until permanent water ceases at Madoleh ("place of blackness"), it is known to the Boran and the Somali under the general name of Lorian. From Madoleh to Afmadu the name is changed once more, and it becomes the Lak Dera. But although in the latter stages of its wanderings the river is generally dry and its channel often ill-defined and overgrown with dense jungle, yet to the careful observer who has patiently followed its course, the main stream-bed is always distinguishable.

The Uaso Nyiro, including the beautiful Chanler's falls, is too well known to need any description; all the rapids occur above Chanler's falls, and shortly after passing the latter the stream emerges from a somewhat narrow pass into the broad, gently sloping alluvial plains that stretch

THE UASO NYIRO, 2 MILES BEFORE EMERGING FROM THE EAST END OF THE MAIN LORIAN SWAMP.

THE SECOND LORIAN SWAMP. THE LINE OF TREES IN THE DISTANCE DENOTES THE ACTUAL COURSE OF THE MAIN CHANNEL OF RIVER.

JUBALAND SOMALI, HERTI TRIBE.

ANCIENT RUINS NEAR GONDAL.

eastwards as far as Madoleh. On the left bank of the river, about 100 miles to the east of Lorian, in long. 38° 54′ east, stands Marti plateau, the last mountain deserving the name between this place and the sea. It is known to Swahili-speaking natives as Kilima-ya-Mesa or Table mountain, and it forms an unmistakable landmark. The river which flows towards it from the south-west, turns east, closely following its base, and then having left it behind, north-east. It is volcanic in origin, and rises abruptly from the river-bank to a height of 1607 feet, that is, 603 feet above the surrounding country. The summit consists of a plateau, higher on the eastern edge and roughly oval in shape, the long axis of which runs almost due east and west. The whole is covered with dense scrub, growing from a rich soft soil. I found several small pools of rain-water hidden away in the bush. Its sides, however, are only sparsely clothed with vegetation, the most characteristic plants being perhaps several species of euphorbia. Just before reaching Marti the Uaso Nyiro attains its greatest development, after which it gradually dwindles until on entering the first and main swamp it is only about 30 feet broad and 2 feet deep.

From Archers Post to within 25 miles of the main swamp dom palms line both banks of the river, and they are especially numerous near Marti—beautiful flat-topped acacia trees, and a species of willow are also very characteristic in this region—grass is abundant on both sides, and though the bush is thick in parts, the scenery on the whole is most lovely and picturesque. About 60 miles to the east of Marti, the river turns gradually eastwards and then south-east. This district is called Melka Gela by the natives, and on the right bank is a small plain slightly depressed in the centre, covered with coarse grass, and very swampy during the rains. Melka is a Somali word meaning a watering-place or ford, and Melka Gela means the watering-place of the camels.

The banks of the river are somewhat high and steep, which makes it inconvenient for cattle, therefore the natives have given names to those places, where it is easy to approach the water. Of these the best known in the Lorian district are Melka Gela, Melka Dera (wide place), Melka Athi (the white place, so called, I believe, owing to the light-coloured soil at this spot), Arodima and Melka Waja (thorn tree place).

Near Melka Gela, I found a Boran boma, or temporary village. These people who inhabit the country northwards from here into Abyssinia, which is their real home, are nomads like the Somali, and are among the richest owners of cattle in East Africa, being second only to the Masai. They are a peaceful, pastoral people, but faint-hearted, and they are being perpetually harassed and plundered on all sides by the Abd Wak, the Samburu, and the Abyssinians. The men wear a very loose kind of trousers, cut off above the knee, made of white cotton, and carry an enormous spear, the shaft being sometimes 9 feet long with a short and clumsily forged blade of iron. They also use with great skill a weak bow, shooting

an arrow with a loose iron head, generally covered with poison. They keep innumerable native dogs, chiefly for hunting purposes, and it is remarkable how quickly these animals will bring an antelope down or hold a larger beast at bay until their master can dispatch it. While the men are hunting or idling, the women do all the work, even guarding the huge herds of cattle while they are grazing, and the children take care of the goats and sheep. They have a most curious method of keeping the lambs and kids from getting lost. Inside the thorn fence that surrounds their villages, they build with branches and logs of wood, pens that exactly resemble huge birds' nests. The bottom is lined with dry grass and reeds, and in this the tiny animals are placed. Every morning and evening they are taken out, one by one, and allowed to go to their mothers for a short time, after which the latter are milked. The milk-pails are made from one piece of giraffe hide, cleverly sewn together, and then well smoked till they are black. The milk is then transferred into gourds, also well smoked and decorated on the outside with rows of beads. The strong taste acquired by this process is much appreciated by them. Marriage takes place at the early age of twelve or thirteen for women and fifteen or sixteen for men. There is no ceremony, the price agreed on being paid, generally in cattle, to the girl's father. Unlike the Somali, the Boran are indescribably filthy in their personal habits, and the white cotton cloth they wear soon becomes a dirty brown.

As the main Lorian swamp is approached the country becomes more open, and the bush more strictly confined to the banks; 3 miles west of the swamp the bush ceases entirely, and the river runs through a flat alluvial plain until it enters the vast expanse of dark green reeds, that stretches in an unbroken line to the horizon. In the south-east a low line of rounded hills can be seen, and between them and the swamp stretch the interminable alluvial flats, dotted here and there with some low thorn bush, weirdly distorted by the ever-present mirage. A more dreary and desolate scene cannot easily be imagined. On entering the swamp the river divides into three channels, the centre one being the largest. The northern channel, which was practically dry when I was there, rejoins the river lower down, but the southern branch finally disappears in the mud to the south-east. Another small stream-bed runs down from the hills in the north and enters the main river-bed at Arodima. As there is no native name for these hills, I would suggest as an appropriate title calling them the Lorian hills.

Six miles south-east of the junction of the Lak Arodima, the reeds give place to coarse grass 9 to 10 feet high and equally dense, and finally in long. 39° 46′ 6″ E. and lat. 1° 0′ 15″ N. the river emerges once more into an open plain. At this point the bush, which covers the Lorian hills, comes down to within half a mile of the river and then recedes far back, until it is met with once again at Madoleh. It is impossible to say exactly how big this swamp really is, since it varies greatly with the seasons, but

to give 50 miles as its circumference would be a conservative estimate. Much water is lost in the swamp by evaporation, but in my opinion the greater part sinks underground. At any rate the river emerges as a narrow shallow stream flowing between high banks. Its course is marked by a thin line of "Waja" trees—a thorn tree, with feathery branches and yellowish-green trunk, which is uncommon except in this district. Six miles further east, it again enters a smaller swamp, consisting of tall grass, a few waja trees, and one or two flat-topped acacias, and in extent 5 miles long by 2 broad, but its size may be increased during the rains. Underfoot in both swamps the ground is very soft and saturated, and when I passed through at the end of February there were about 6 inches of surface water. Very interesting was a small island of solid ground in the middle of the smaller swamp, on which I found two small bush shelters, where three or four men had obviously been hiding.

While working in these swamps I was much troubled by countless swarms of mosquitoes (chiefly *Stegomyia*). They are found in incredible numbers near the river, becoming scarcer and scarcer as one leaves it, until they disappear at a distance of about 5 miles away. Along the water's edge their attentions become almost unbearable, attacking one in a perfect swarm all day long, and although a mosquito curtain kept them off at night, the irritation caused by their bites made sleep impossible. Though numerous in Jubaland, I had never met them in sufficient numbers to cause much annoyance, but in the Lorian—hunger, heat, fatigue, and all the other inconveniences which a traveller must of necessity endure, sank into insignificance compared to the irritation and pain caused by these abominable insects.

After leaving this swamp, the river runs through another alluvial plain for 11 miles, gradually diminishing in size until permanent water ends in a series of shallow pools, surrounded by trees and bush. This place is known to the natives as Madoleh. According to native report, during a very dry season running water may cease even further west, in which case it is replaced by a long string of shallow pools, in which vast quantities of fish find a temporary refuge, until water begins to flow once more. The whole of the Lorian district may be considered as a shallow valley, sloping gently to the south-east, whose floor consists of an alluvial plain of great extent, divided unequally into two parts by the river and the swamps through which it flows. It possesses, in my opinion, great agricultural possibilities, and rice, cotton, and maize would grow extremely well on both banks, while the formation of the country and the character of the river would enable irrigation to be carried out without any difficulty.

Known now as the Lak Dera, the river-bed winds its way in an easterly direction through a dense and arid bush country towards the sea. It runs in a broad, shallow valley, bounded on north and south above Sereda by low rounded hills, and its bed varies from 10 yards to

300 yards in width, generally sandy in character and much overgrown with bush and jungle. Some 30 miles below Tur Guda (= clump of Guda thorn trees), at a place called Dakajar, it is joined by the Lak Aboloni, and here to a limited extent the country again becomes fertile, only to relapse once more into its accustomed hopeless aridity, long before Afmadu is reached. Here it is joined by the Lak Jera, and together they turn southwards until they enter the Deshek Wama, from which there is an outlet into the Juba river.

After a plentiful rainy season water runs from the Lorian into the Deshek Wama, and in this connection it is interesting to note that the natives say that two days before water flows down the Lak Dera, the bed of the river becomes noticeably wet, and when they see this they know they can take their cattle further west. At Afmadu the wells are dug in the river-bed, and the water supply is permanent. This would seem to show that there is an underground flow of water, and in my opinion there is such a flow from Madoleh eastwards. The fall in the level of the Lak Dera is very slight, especially at first, and averages about 1 in 600, though just below Tur Guda it is increased to 1 in 200.

Such, then, is a brief account of my journey across Jubaland to the Lorian swamp. The map I made depends on a prismatic compass traverse between Kismayu and Melka Waja, checked by frequent astronomical observations for latitude and longitude. The wooded nature of the country, and its extreme flatness, rendered any other method impossible with the time at my disposal; moreover, the expense would have been enormous.

From Melka Waja to the other side of Marti mountain the map is based on a plane-table traverse and sketches, also checked by astronomical observations; the heights throughout were calculated by aneroid, boiling point, and clinometer, while the variation of the compass was ascertained by azimuth observations with a theodolite.

After leaving Marti, my food supply became exhausted, and I depended solely on what meat I could shoot for myself and my men; but by dint of hard work, I arrived at Meru six days later, the last march of 43 miles being accomplished in fourteen hours without a halt. From there it was but a short step to Nairobi and to civilization.

Mr. Douglas Freshfield (Vice-President, in the chair): A great deal of water has flowed under the bridges since some thirty years ago, I, as one of your hon. secretaries, had to draw up the instructions for Joseph Thomson to make his way 'Through Masai Land' (this was the title of the book he subsequently published), and between the two great mountains, Kenia and Kilimanjaro, to the Victoria Nyanza. In those days that journey seemed so difficult and dangerous, I almost felt as if I was signing a death warrant. Now a railway rushes where even the hardiest explorers feared to tread. For new matter one has to look to the remote corners of our possessions in East Africa. It was only last month you had a paper on the extreme south-western corner of Uganda, the Mfumbiro district. I once saw those mountains from the north end of Lake Edward after a thunderstorm—

clear-cut cones and ridges, reminding me of the view of the Trentine Alps seen from the end of Lake Garda on the way from Milan to Venice.

To-day we turn to the north-eastern corner, not of Uganda, but of East Africa, and here I am afraid we have none of the mountains which are particularly dear to me. We have, however, a country that is interesting on many grounds. We find a river which contradicts the poets' statement "that even the weariest river winds somewhere safe to sea." Mr. Dracopoli has proved that it dies in a swamp. It is a region which may possibly in the future be of some service by growing cotton. At present it seems to produce principally mosquitoes!

The gentleman who has come here to lecture to us to-night is most fully qualified to give us a scientific description of the country he has traversed. If I may use the expression, he is a product of our Society. Some years ago he travelled extensively in Mexico, and carried out explorations there of which he read an account to the British Association. When these were cut short by the unhappy internal warfare which has recently prevailed in that country, Mr. Dracopoli turned his attention to East Africa, where he had been previously. Before going out, however, he sought instruction from Mr. Reeves, and made himself so competent in surveying and mapping that the Director of Surveys of British East Africa tells us, with regard to that portion of East Africa where he travelled, he has provided him with most valuable material for the completion of the great map of the world now in progress. I do not think there is anything further I need say in order to introduce Mr. Dracopoli to your favourable notice. I will now ask him to read his paper.

Sir ALFRED SHARPE (after the paper): I do not know that there are any remarks of interest I can make, as I do not know this part of Africa. Mr. Dracopoli has explored one of the very few remaining corners, a very interesting one, of Eastern Africa. I know well, that when one travels through any part of that continent where no one has been before, one's difficulties are enormous—carriers always wish to return, and it is all one can do to grapple with the difficulties in getting forward. I congratulate Mr. Dracopoli on having made a very interesting and successful journey.

Mr. FRESHFIELD: We have here also Mr. Elliott, who has been converting the natives of Jubaland into policemen, and who gave us a paper on that region in one of the recent numbers of our Journal. I am sure he will have something interesting to say on the subject.

Mr. F. ELLIOTT: It has been a great pleasure to me to have listened to the very admirable paper which we have heard to-night. My work as a policeman for three years in Jubaland enabled me from time to time to make various journeys into the less inaccessible parts of that country, and although these journeys were very minor ones in comparison to that which we have had described to-night, I can assure you from personal experience that there are a very large number of difficulties and dangers attached to such a journey as the one Mr. Dracopoli undertook. Possibly there are certain gentlemen here to-night who have never had, shall I say, the privilege of making a journey through such a country as that which has been described. May I ask those gentlemen to-night, for one moment, to imagine that they themselves are making that journey. You have a certain number of camels loaded with your personal kit, food for yourselves and your men, and carrying a number of water-tins.

You are travelling through unknown, pathless, and, in many parts, waterless country. You have also with you a certain number of syces to look after your camels, a small escort of police, and perhaps two guides more or less unreliable. You are passing through country so thick with bush in some parts that it appears

almost impossible to cut a way through. You know that the natives of that country, Somali, are certainly unfriendly towards white men, and reported to be very treacherous. You are given an objective—a watering place—where you are told you can get a fresh supply of water. The place may be 50, 60 or 100 miles away from where you are. After innumerable difficulties you reach the place—to find there is no water! Your tins of water probably by this time are three parts empty, your men are certainly discontented because of the enormous amount of work they have had in cutting a path through the bush, and they are also probably very nervous, because there is always a possibility of an attack by the young Somali. These young men are always on the look-out for the opportunity of gaining what they call the "Bal," which means the feather head-dress they are allowed to wear after they have killed a man in fight.

You have reached your objective and find there is no water. You are told the next watering place is perhaps another 60 miles further on. Now there is a problem for you. You are told you can do either of two things; you can decide that discretion is the better part of valour and return to your base, or you can risk it and go forward on the chance of finding water at the next watering-hole. If you don't find water you are "done," for the simple reason you must die of thirst! In deciding such a question it is not so much the risk of losing your own life that bothers you, as the risk of the lives of the men dependent upon you, who, with the most complete confidence, rely on you to bring them back safely home.

That is only one incident of the many which Mr. Dracopoli would have to face on the journey which he made. What did he do? I was in Kismayu when he arrived. He came with a scheme to travel through the most inaccessible and least-known part of the whole of Jubaland—a part inhabited by the two most truculent and least civilized sub-tribes of the whole of the Ogaden Somali. He certainly had one of those most unpleasant of all friends, the pessimist, myself; and possibly there were others who lost no opportunity of warning him of the dangers and difficulties he would have to face if he undertook the journey he suggested. Despite all this you have heard to-night he adhered to his plans and carried them through most successfully.

I think that you will agree with me that such a journey must have called for no small amount of pluck and determination on the part of the gentleman who undertook it.

Mr. FRESHFIELD: If there is no one else who wishes to address the meeting I will conclude in the usual way by moving a vote of thanks to the lecturer, and in doing so, I think we must all feel that he is an ideal specimen of the modern traveller, because he has not only qualified himself to use instruments, but wherever he has been he has also used his eyes. One has felt at every moment that there was nothing in that region—a region which, perhaps, is not so varied in its attractions as other parts of the world—nothing of interest which escaped his observation, or which he did not bring forward. I specially noticed the way in which Mr. Dracopoli brought out the native names and their meanings. I wish all travellers would do the same. There is nothing which gives cartographers more pleasure than when a traveller brings back native names. We prefer a traveller who does that to one who goes about and fastens personal names on natural objects—particularly when those objects are great mountains. We have to thank Mr. Dracopoli for a very pleasant evening, and for the excellent slides he has shown us, which illustrated the character—and in some ways the unpleasant character—of travel in that portion of East Africa. I therefore propose, and I am sure you will carry it with acclamation, that we pass a hearty vote of thanks to the lecturer.

MOZAMBIQUE: A GEOGRAPHICAL STUDY.*

By ARTHUR HOLMES, A.R.C.S., F.G.S., F.R.G.S., and ALEXANDER WRAY, B.Sc., F.G.S.

In 1911 the authors had the good fortune to be geologists to an expedition organized by the Memba Minerals, Ltd., for the purpose of exploring the Portuguese East African province of Mozambique. The only accounts which had hitherto been published of this little-known territory were those of Lieut. O'Neill,† H.B.M. Consul at Mozambique, who was the first European to penetrate beyond the coastal region. Though the natives had previously held an unwarranted reputation for ferocity and hostility, Lieut. O'Neill successfully crossed from Mozambique to British Central Africa, along the main native routes through the territory. In his papers he gives a very complete and faithful account of the native inhabitants; and as our former colleague, Mr. R. L. Reid, is publishing simultaneously ‡ a short record of the expedition which he accompanied, we shall here confine ourselves to a brief description of the outstanding geographical features of Mozambique. Our thanks are due to our friend Mr. E. J. Wayland, F.G.S., whose notes on the geological structure of the Ribawe district have been freely placed at our disposal.

Mozambique is a well-defined territory, the greater part of which is enclosed in a natural triangle, the coast-line forming the base, the Luli (or Lurio) river the northern boundary, and the Ligonia river the southern boundary. From the headwaters of the Ligonia to those of the Luli, the political boundary between Mozambique and Zambezia is drawn along lat. 15° 10′. Geographically, however, the apex of the triangle is formed by the famous Namuli peaks, 250 to 260 miles from the coast. From that point the land slopes away in every direction, a statement which applies not only to the surface of the plateau, but also to the summits of the isolated mountain systems which rise precipitously from its gently undulating surface.

The coast-line includes three excellent harbours, one of which, the southern arm of Fernão Velloso bay, is probably the finest along the whole East African seaboard, with the single exception of Delagoa bay. This valuable but practically unused harbour is a land-locked arm of the sea, the entrance to which narrows down to half a mile. Deep water extends to its extreme southern margin, affording perfectly secure and sheltered anchorages throughout a length of 16 miles. To the Makua it

* Reference should be made to the map accompanying the paper on Mozambique by Mr. R. L. Reid in the *Journal* for July, p. 112.

† H. E. O'Neill, "A Three Months' Journey in the Makua and Lomwe Countries" (*Proc. R.G.S.*, p. 193 (1882)); "Journey from Mozambique to Lakes Shirwa and Amaramba" (*Ibid.*, pp. 632 and 713 (1884)); "Eastern Africa between the Zambesi and Rovuma Rivers" (*Ibid.*, p 430 (1885); also *Scot. Geog. Mag.*, July, 1885).

‡ See *Geographical Journal* for July, p. 44.

is known as *Masasima*, "the harbour of safety," but the only boats which ply on its waters are the dhows of the Banyan traders and the tiny *pangaios*, or fishing smacks, of the natives.

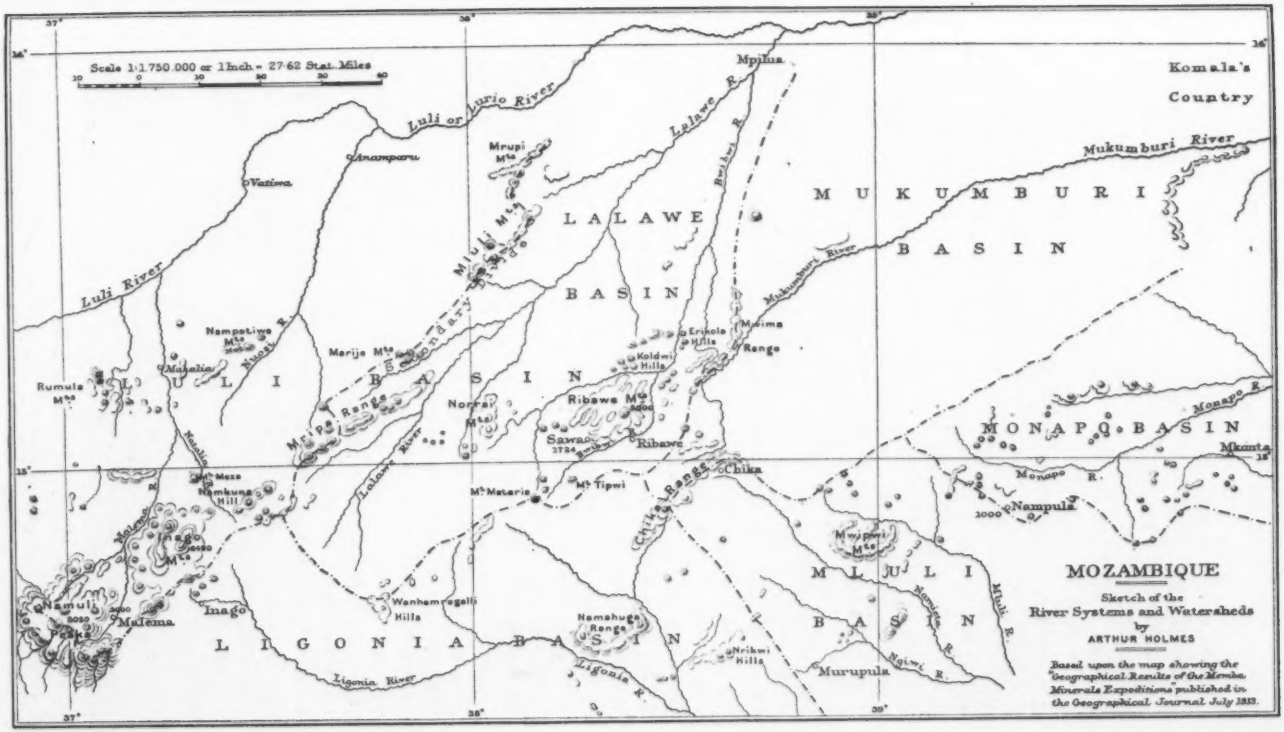
What may be called the *coastal zone*, corresponding to the Temborari and Foot plateaux of British East Africa, varies in width up to 10 miles. It is formed by a narrow belt of Cretaceous and Tertiary sediments, the shore itself being fringed with loosely cemented coral rocks, sand-dunes, and raised beaches. Mounts Meza and Pao, the Table and the Sugar Loaf, and the Kobe mountains further north, are well-known landmarks plainly visible from the sea; but for the most part the coast appears to be an unattractive expanse of lowlying ground, relieved only by the greenery of the coco-nut palm. Into the sedimentary formations the sea stretches in long and tortuous arms, but locally, as along the western shores of Memba and Fernao Velloso bays, the old gneisses, which constitute the foundation-stones of the continent, stand out in rugged cliffs, and present a more resistant barrier to the inroads of the sea.

The upper reaches of the winding peneplane with which the coastal zone is dissected are now flooded only by exceptionally high tides. For the greater part of the year they are merely sandy wastes, strewn with a coarse gravel of quartz and other pebbles. Natural salt pans are found in certain localities, where a sand-dune holds back all but the highest tides. The natives and Banyans have not been slow to appreciate these natural advantages, and a considerable salt industry has been developed all along the coast. Seawards the floor of these marine plains becomes soft and muddy, and the tide-swept areas degenerate into mangrove swamps, inhabited only by vividly coloured crabs, and pervaded by a loathsome and oppressive odour.

The *volcanic belt* of East Africa, which stretches southwards from Abyssinia and assumes gigantic proportions in the peaks of Kenya and Kilimanjaro, finds only a poor equivalent in Mozambique. Here in Tertiary times lavas of both basaltic and phonolitic types were extruded, clearly as the result of fissure eruptions. Denudation has now reduced the flows to a few scattered remnants, which are found in a belt running north and south from the Sanhuti river to Mokambo bay.*

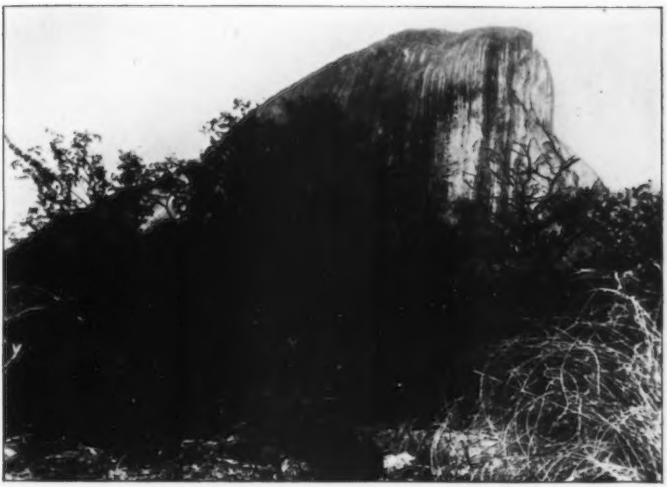
Beyond the coastal and volcanic belts the country gradually rises westwards, a vast plateau consisting entirely of metamorphic rocks, chiefly gneisses, accompanied by intrusive granites. The plateau itself is remarkably regular in character, although to the west of Ribawe it becomes more broken, and the scenery more typically mountainous. Rising steadily upward, an elevation of 1000 feet is reached at Nampula. At Ribawe almost twice that height is attained, and in the Namuli district the plateau culminates at about 3000 feet above sea-level. Proceeding westwards from the coast, the country begins to be diversified with isolated peaks or

* See Holmes and Wray, "Outlines of the Geology of Mozambique" (*Geol. Mag.*, p. 412 (1912)).


Scale 1:1,750,000 or 1 Inch = 27·62 Stat. Miles
Komala's Country
Mpilua
Luli or Lurio River
Lalawe R.
Mukumburi River
Mrupi Mt.
Vatiwa
Anamparu
Luli River
LALAWE BASIN
MUKUMBURI BASIN
Nampatiwe Mt.
Marije Mt.
Boundary
Rumula Mt.
LULI BASIN
Mpepa Range
Lalawe River
Norral
Ribawe Mt.
Sawao
Ribawe
Erinola Hills
Koldwi Hills
Mwima Range
Monapo R.
MONAPO BASIN
Mkuma
Chika
Chiuli Range
Mt. Tipwi
Mt. Matarie
Nampula
Mwipwi Mt.
Namuli
Malema
Inago
Wanhemregalli Hills
Namahuga Range
Nrikwi Hills
Murupula
Ngwi R.
Mtuli R.
Ligonia River
LIGONIA BASIN
MOZAMBIQUE
Sketch of the River Systems and Watersheds
by
ARTHUR HOLMES
Based upon the map showing the Geographical Results of the Mombe Mineral Expeditions published in the Geographical Journal, July 1913.

clusters of hills, which rise abruptly from the surface of the plateau and exhibit the most remarkable outlines. Within 30 miles of the coast these island mountains are not numerous, and only rise a few hundred feet above the surrounding country. Further inland, however, they gradually increase in numbers and bulk, until, assembled together in picturesque chains or hurled up, peak upon peak, in towering blocks of rugged gneiss, they co-operate to form fantastic and impressive mountain systems, which arrest the attention by the colossal scale of their daring architecture. The scenery to which they give rise is of a peculiar character. The summits of the peaks are of every conceivable shape, varying from gracefully rounded domes of smooth and naked gneiss to irregular knobs and pinnacles. In general, the outlines approximate to smooth curves above, dropping precipitously to the plateau surface below. Where rough and uneven contours have survived, they are often due to immense blocks, which have resisted the ravages of denudation, and of which some appear to be perched in positions of alarming instability. Such irregularities may also be traced to the fracturing of rocks along their joint planes, instead of by the more usual process of exfoliation parallel to their rounded surfaces. The most striking feature of these detached groups of hills lies in the abruptness of their discontinuity with the plateau. No preliminary foothills announce their sudden elevation, but all around their scored and barren sides is distributed a litter of débris, gigantic rocks, and boulders, woven together by a twining growth of scrub and thorn.

The origin of this peculiar type of scenery is still imperfectly understood, and the relative importance to be given to original structure, differential elevation or subsidence, erosion and weathering, is often uncertain. All three factors seem to have been operative in bringing about the inselberg landscape of Mozambique. When associated groups of inselberg are viewed collectively, a remarkable linear arrangement is often exhibited. The strike of the foliation of the gneiss varies in direction between north-east to south-west and north-north-east to south-south-west, and in places it may even follow a line more nearly north to south. A significant detail is that in the neighbourhood of some of the hills and on the hills themselves, the strike often sweeps completely round, forming a closed circuit roughly parallel to the contours. While this is the case, the axis of elongation of a single hill or turtleback, or of a series of related inselberg usually follows the predominant direction of strike, and whole mountain groups may thus be correlated by the parallelism of their axis. A striking example of this on a broad scale is afforded by the Namuli, Inago, Mripa, and Mluli mountain systems. The linear dispositions of many of the detached hills taken together with their individual petrography, points to the suggestion that the inselberg themselves mark the positions of phacolitic or batholitic intrusions of igneous rock below. It would seem that dome-like intrusions have been the primary cause in determining the sites occupied by the present inselberg, the contrast of



INSELBERG PEAK, MRUPI MOUNTAINS.

ON THE EASTERN WALLS OF THE RIBAWE MASSIF.

TURTLEBACK OF GNEISS IN THE AXIS OF THE CHIKA RANGE.

MWIPWI RANGE AS SEEN FROM THE EAST.

surface relief brought about by weathering and erosion being the outward expression of internal structure. Perhaps the most remarkable of these lines of inselberg is one to the north of the Ribawe range. From the summit of the highest point of the twin peak of Ericola, the Koldwi hills are seen to the south-west standing up boldly like two huge sentinels guarding the entrance to the Mtupa pass (Ribwe). Beyond them a succession of similar cone-shaped hills can be seen, all in a perfectly straight line running from north-east to south-west.

In certain groups of mountains block-faulting, superimposed upon, and to some extent determined by, the earlier and more fundamental structures, seems to have played an important part in the precipitous elevation of the peaks. One line of fracture and differential elevation is very well marked in the Ribawe district. From the south-east, the Ribawe range has the appearance of a squarish block with extraordinary steep sides, deeply grooved and scored. Closer inspection reveals the "bedding" dipping away northwards at a moderate angle, in marked discontinuity with that of the surrounding plateau. The structure immediately suggests that a fault, running approximately north and south, has determined the eastern walls of the range. Following the same direction is the valley of the Bwibwi. Along the eastern side of the mountains the river takes a wonderfully straight course, from which it does not sensibly deviate until the Ribawe peaks are left behind. Parallel to the same tectonic line is the Mtupa pass, which runs through the Ribawe mountains from end to end. Parallel again is the precipice which truncates the contours of the Ericola peaks. To ascend this impressive mass of granite and gneiss from the east is an easy matter, but approached from the west it presents a sheer vertical cliff of several hundred feet. The same discontinuity in the dip and strike of the gneissic foliation is again apparent. Other parallel structural lines to be correlated with the same system of faulting can be found in the Muima range and in the basin of the Nrassi river and its tributaries.

While block-faulting has undoubtedly played an important rôle in determining the development of those of the inselberg which can be interpreted as horsts, the wide expanse of plain which surrounds the island-mountains and which is devoid of any marked undulations must be the result of erosional agencies of some type or other. Dr. Bornhardt,* after studying this peculiar type of topography in German East Africa, was at first inclined to refer it to marine denudation, but later he modified this view, and now considers that it was probably produced during successive cycles of depression and uplift, that is, during alternating periods of weathering and erosion. Very similar views are held by Dr. J. D. Falconer † to account for the origin of a similar type of scenery in Northern Nigeria.

* W. Bornhardt, 'Die Oberflächengestaltung und Geologie Deutsch Ost Afrika,' Bd. VII. Berlin, 1900.

† J. D. Falconer, 'Geology and Geography of Northern Nigeria.' London, 1911. See also *Rep. Brit. Ass.* for 1912, p. 476.

During a period of weathering and base levelling, the less-resistant rocks are decomposed to a considerable depth. Subsequent elevation having rejuvenated the streams and endowed them with greater erosional activity, the weathered gneiss is removed, and the more resistant rocks, fortified perhaps by a core of granite far below, now begin to project. The characteristically rounded form assumed by the isolated hills and peaks is simply an expression of the fact that the degree of weathering in a given time depends on the curvature of the surface. Sharp corners are most easily rotted away and removed by the ravages of denudation, and a dome-shaped form is that which is most permanent and stable.

Some of the more prominent ranges have already been mentioned. The high wall of Chika follows the general strike of the country rising to nearly 4000 feet. The central peak of the Ribawe massif reaches a height of 5000 feet. Westward from the neighbourhood of Ribawe and Sawa, the inselberg scenery is less striking, but the country becomes more rugged and mountainous. Among the more prominent ranges are the Mluli, Mrupi, and Rumuli mountains, each of which reaches 5000 feet above sea-level.

The Nampatiwa mountains are very conspicuous on account of their isolation and precipitous sides, for they rise up practically sheer from the plateau surface to 6000 feet above sea-level. The Inago system is similar to that of Ribawe, but on a bolder and more gigantic scale, the crowning peak rising to 6490 feet. The Namuli peaks are, however, the most interesting group, and in them one sees the finest scenery of the whole territory.

The culminating peak of the whole group is an unscaleable truncated cone, more strictly a double cone, which reaches a height of 8050 feet. It was for long conjectured that the peaks were of volcanic origin, but Mr. J. T. Last * in 1887 described the summit as "an almost perpendicular mass of white stone." In a letter to one of the authors last year he stated his opinion, in perfect accord with the actual facts, that the Namuli peaks, like the other mountain systems which rise from the plateau, are simply huge outstanding masses of the greyish-white granite which is found throughout the country.

These mountains attain a sufficient altitude above sea-level to ensure a fairly continuous rainfall throughout the year, and their slopes are therefore well watered and luxuriantly clothed with vegetation. Above the almost impassable jungle formed by the intertwining of vines and creepers rise groups of towering trees, whose interlocking branches provide a cool canopy in which innumerable hordes of monkeys find a congenial home. Here and there the traveller emerges into open glades of park land, which offer a charming contrast to the monotony of the forests, and on the banks of the watercourses an abundant flora delights his eye, dappling the fresh greenery with glowing clusters of delicate flowers.

* On the Namuli peaks, see J. T. Last, "Journey from Blantyre to the Namuli Peaks" (*Proc. R.G.S.*, p. 42 (1887); "On the Society's Expedition to the Namuli Peaks" (*ibid.*, p. 467 (1887)).

In Mozambique the mountains are everywhere held in great veneration by the natives, and in the west this reverence for Nature's architecture amounts almost to mountain worship, for the Lomwe people have a legend that the first man and woman were born from the white peak of Namuli.

To the west of Mozambique itself extends a highland plateau culminating in the Mlanje mountains, typical of Sir Harry Johnston's "Jack-in-the-bean-stalk" country; this district has already been described by several travellers, notably by Mr. J. T. Last, in this *Journal* in 1890.

For the most part the Mozambique territory is heavily wooded, although the density of vegetation is by no means uniform. The almost continuous succession of gloomy forest gives place here and there to lightly wooded park-like country. In the lowlying areas the swampy ground harbours a thick growth of stiff and tangled grasses, and around the slopes of the mountains wide areas are monopolized by circling belts of bamboo. To the west, where the country becomes rough and mountainous, thick forests abundantly stocked with game alternate with tall grassland and bare and rocky turtlebacks. High up on the inselberg very little vegetation finds a foothold. In cracks here and there a few trees gain a precarious footing, but others less successful in their growth have forced away their support and lie grey and dead on the inhospitable ridges.

The panorama to be seen from the summit of one of these hills is at once striking and significant. On every side the plateau is seen like a verdant sea of rolling forest stretching away to the horizon. The winding courses of the rivers are plainly mapped out by the brighter scenery of their banks, and above the varied tints of brown and green, rise up the fantastic peaks and domes of the rocky island-mountains.

The structural directions of the country give the key to the river systems, nearly all of which are intimately related to the strike of the gneiss. The primary watershed follows a zigzag line which is either parallel or perpendicular to the direction of foliation. It runs from the Namuli peaks to the north-east through the Inago mountains nearly up to lat. 15°. Continuing along the same direction, a secondary dividing line passes through the Mripa and Mluli mountains. Just south of lat. 15°, however, the main watershed turns to the south-east, retaining that direction until it is turned back along the strike by the Wanham-ragalli hills. It then passes round Mounts Mataria and Tipwi to the south of Ribawe, and runs along the high eastern wall of Chika up to lat. 15°. The southern part of the Chika range forms an important hydrographical centre. Four drainage systems converge on that point, as indicated on the accompanying map. Tributary streams flowing to the Luli and the Ligonia are fed from the southern and western slopes of the range, and two important rivers, the Mukumburi flowing to the north-east, and the Namieta flowing to the south-west, are born in its longitudinal valleys. The Namieta is the main river of the south-eastern basin. According to the chief at Lope, it receives the waters of the Ngiwi

a long day's journey to the south-east of that village. Soon afterwards it is joined by the Mluli, a stream which drains the Mwipwi range and the hills to the north and east. Under the name of its smaller branch, the Mluli, the river flows coastwards, ultimately entering the Mozambique channel as the Angoche river. Unfortunately a great stretch of unexplored country extends between Nampula and Angoche, and the course taken by the Mluli can as yet only be surmised. To the north of the Mwipwi mountains the hydrographical axis again divides, the two arms enclosing the basin of the Monapo river.

A glance at the map clearly indicates the relation of the watersheds and rivers to the direction of strike. Except where faulting has complicated the issue, the main streams may be divided into two well-marked groups, *subsequent* when they follow the predominant direction of strike and mountain range, and *consequent* when they cut across the structural axes of the country.

With the exception of the Monapo, the rivers and their important tributaries have their heads in the high ranges of the interior, and are fed by rapid mountain torrents of icy-cold water which flow continuously throughout the year. In their middle and lower courses, the streams become wide and shallow, and cease running entirely during the dry months of the year. In their broad channels of sand and gravel, only a few stagnant pools then remain, and even these may dry up at times. However, water may always be obtained by digging, and during the dry season all the water used on the coastal belt is obtained in this way. Throughout the country the evidence consistently points to the recent rejuvenation of the streams. The coast is fringed with coral reefs, and raised beaches are found at an elevation of 20 to 30 feet above high tide. Endowed with renewed energy, the streams have thus been enabled to cut gulleys in the sands and gravels of an earlier epoch. In the mountain systems small hanging valleys are occasionally developed, the minor tributaries having been unable to keep pace with the larger streams in the work of lowering the valley floor.

The Luli river, known by the Portuguese as the Lurio, rises in the Luasi hills on the eastern borders of Lake Shirwa and flows for some 400 miles before entering the ocean at Lurio bay. From the Mamuli peaks it receives two important tributaries, the Nalume and the Malema, each of which swarms with fish. Near Vatiwa, where the Luli breaks up into six branches, the river tumbles over a bar of hard granitic rock in foaming rapids and cascades into a seething pool below, where numerous hippopotami and crocodiles disport themselves in the turbulent water. The Luli then takes a circuitous course through Anamparu's country and flows through an alternation of broad, thickly wooded valley and bare rocky gorge, till at its mouth it broadens out into a dreary expanse of sand and mud, which, in the dry season, may be crossed on foot.

The Malema river rises in the Namuli peaks, and is fed by the mountain

torrents which drain to the north-west. After receiving its most important tributary, the Natalea, which drains the Inago and Namkuma mountains, the main stream finally emerges in a broad and fertile valley through which it flows northwards to the Luli. The scenery of the Upper Malema valley is very delightful, and, writing of its beauties, Mr. Last truly says, "Nature here seems to have used all her power to make the place a lovely spot, a feast for human eyes." At Makalia the river is over 200 feet wide, and even in the "dry" season it is running full with a strong current. The longest tributary of the Luli is the Lalawe river, which is joined not far from its confluence with the Luli by another important stream, the Bwibwi. According to the natives the junction of these two streams is situated close to the village of Mpilua, a powerful and hostile chief who refused to allow the expedition to enter his country. The lower courses of the Lalawe and Bwibwi are therefore still unexplored, but their headwaters, draining all the land between the Mwima and Ribawe mountains and the Mripa and Mluli mountains, are well known. Between the Norrai and the Mripa mountains, the Lalawe, which is here about 180 feet wide, flows through an open country almost devoid of heavy vegetation. The district is densely populated, and wide stretches of cultivated land extend for miles on each side of the valley, rice and tobacco being seen in addition to the usual cereals.

The Mukumburi river is known only in the upper and lower parts of its course. For 100 miles it flows through a hostile country which has never yet been crossed. The river rises in the deep valleys of the Chika range and flows to the north and north-east, through a district thickly studded with inselberg peaks. Where we met it again south of Komala's country and west of Namisako, the contrast in scenery was very great indeed. The river there flows sluggishly through a lowlying and extensive plain which is interrupted only by a few isolated kopjes, 100 to 200 feet high. Although the district is thickly populated, it is notoriously unhealthy, and the prevalence of malarial and blackwater fevers affords a sinister evidence of the malevolent attacks of the iniquitous mosquito.

At the mouth of the Mukuburi is the recent Portuguese settlement of Memba, built on the rugged gneissose cliffs which overlook the bay of the same name. The war against disease is here being bravely carried forward in the face of extreme difficulties. Extensive clearings have been particularly necessary, for to the immediate north of the Capitania there are dreary wastes of stagnant pools and mangrove swamps which extend throughout the lowlying district of Muendazi, and provide a home for countless swarms of mosquitoes.

The unhealthy character of the coastal belt and the hostility of the natives of the hinterland have hitherto debarred the Portuguese from opening up this territory with the success which has attended their occupation of the Zambezi valley to the south. It is, however, a pleasure to observe that after centuries of lethargy they are now awakening to the possibilities of

the country over which they have been the nominal rulers for so long. The productive valley of the Malema and the elevated country to the west, with its excellent climate and fertile lands, is at last being opened up. Military roads linking up the isolated forts which are dotted about the country have been constructed along the coast, and inland along the main trade routes. But up to the present, the Portuguese occupation is only a military one, and much further effort is necessary to develop the province. If this country is ever to be allowed to stretch its cramped limbs, more roads will be necessary to act as arteries along which produce can be brought quickly from the hinterland to the coast. As a preliminary to the initiation of trade and settlement the hostile chiefs must be subjugated, and order preserved by a firm and just administration. Along these lines a laudable attempt is now being made to improve the fortunes of a country which all too long has been one of the most backward of the East African coastland.

THE SHORELINE OF CASCUMPEQUE HARBOUR, PRINCE EDWARD ISLAND.

By DOUGLAS WILSON JOHNSON, Columbia University.

EAST of New Brunswick, and north of Nova Scotia, there existed in recent geological time an extensive area of low undulating plains, produced by the long-continued action of subaerial erosive agents upon non-resistant red sandstones and shales. Because the rock series dipped gently northward, and because some of the layers were a little more resistant than others, erosion had fashioned a rudely crescent-shaped cuesta, whose steeper side faced southward toward a shallow crescentic lowland, and whose gentle back slope descended gradually to lower land farther north. Nevertheless, the rocks were so nearly flat that the low cuesta was by no means a striking topographical feature; and the shallow stream valleys which dissected it branched irregularly in all directions, cutting it into low hills, whose gentle slopes became cloaked with red soil. A new element was introduced into the scenery when a sinking of the land or a rising of the sea-level permitted the salt waters to submerge so much of the lowland that only the highest portion of the cuesta remained as a land area projecting slightly above the sea, with ragged margins where the sea reached far inland along branching river valleys, or the intervening hills projected out to sea as lowlying peninsulas. This low crescentic remnant of a once more extensive land area is known as Prince Edward island.

The visitor who approaches the island from the south side of the Straits of Northumberland, as the water now filling the crescentic lowland is called, may see from a distance richly coloured cliffs which tell him that the waves are actively cutting into the island of red sandstone in their endeavour to consume it. Landing at Summerside, he may take a train and travel west and north over a gently undulating country, in

which shallow valleys of late mature aspect separate low and flat divides covered with cultivated fields or areas of woodland. On either side both valleys and divides slope down to the sea, which is never far away, and which sometimes reaches almost across the island in the form of branching bays. That these bays are but the submerged portions of a dendritic drainage system is evident from an inspection of the map.

The cycle of marine erosion initiated by the submergence which gave Prince Edward island its insular position and its irregular outline has not yet reached maturity. On the south the headlands have been cut back some distance, and bars are extending themselves across some of the bays; but as a whole the shoreline retains much of its initial irregularity. On the north, where the more vigorous waves of the Gulf of St. Lawrence attack the shore, the cycle of shoreline development is more advanced; headlands have been appreciably retrogaded, and bars or barrier beaches have been built across the mouths of a number of the bays, until the outer shoreline is now much more regular than was the initial shoreline. But even here the shore has not been cut back of the original bays, and therefore the shoreline cannot be said to have reached maturity.

Cascumpeque harbour, near the western extremity of the northern shoreline, is a typical example of a bay formed by the submergence of a dendritic river system. A barrier sand reef, interrupted by a number of inlets, separates the harbour from the waters of the gulf, and continuing south-eastward, forms a similar barrier between the gulf and Richmond bay. The barrier reef was first formed some distance from the shore, and while the waves are now actively pushing it landward along part of its length at least, the reef does not yet touch the land at any point between Cascumpeque harbour and Richmond bay. These two bays are therefore connected by a long strip of shallow water, known as "The Narrows." Because of the colour of the rock upon which the waves are working, the shore cliff and the sand reefs are a rich red, which contrasts strongly with the bright green of the cultivated fields or the darker hue of ever-green forest.

When the land surrounding Cascumpeque harbour was still a dense wilderness, Abraham Gesnor explored its shores in canoes paddled by Indians, and found what he believed to be good evidence of a recent sinking of the land. That there has been a sinking of the land or a rising of the sea some time in the past, is clearly indicated by the physiographic evidence outlined above. But the question as to whether or not the land has been sinking in recent times is not yet answered to the satisfaction of all, and we must therefore examine the evidence of recent subsidence with unusual care.

Gesner examined "nearly all the most interesting parts of the coasts" from New Jersey to Northern Labrador, and on the basis of his observations published a paper "On Elevations and Depressions of the Earth in North America." * On the basis of his observations Gesner described portions

* *Quarterly Journal, Geological Society, London*, 17, pp. 381-388 (1861).

of the coast as undergoing elevation, and other portions as subsiding; and concluded that "there is a slow and constant undulatory movement of the Earth's surface" (p. 388). It is now clear that this author confused features many thousands of years old with those of very recent date, regarding them all as recent phenomena. For example, the deposits of marine sediments containing shells similar to those now inhabiting the adjacent ocean, but found a number of feet above high tide, may have reached their elevated position thousands of years ago, and the coast where they were found might now be stable, or even subsiding, although cited by Gesner as a rising coast. This criticism does not apply, however, to the author's description of Cascumpeque harbour, to which we may now profitably turn.

According to Gesner, the harbour of Cascumpeque is bounded on one side for 2½ miles by a perpendicular wall of sphagnum peat, which extends 19 feet below sea-level. This is the line of cliffs now known to the inhabitants of the district as the Black Bank. Gesner does not believe that the peat could have descended from higher land to its present position, and implies that the peat must have formed in place on dry land, and have been partially submerged by a sinking of that land. His description of further indications of recent subsidence is of still greater interest. "In the lagoon the sea flowed, at the time of the writer's visit, into groves of maple, beech, birch, etc., which are constantly falling down from the sea-water overflowing their roots. The marshes where they meet the water are filled with fallen timber, and all taken together presents a desolate picture of the changes that are still in progress" (p. 387).

In 1871, ten years after the publication of Gesner's paper, J. W. Dawson and B. J. Harrington made a geological exploration of Prince Edward island, in the course of which they visited Cascumpeque harbour, and examined the Black Bank peat deposit. These authors do not refer to Gesner's published account of this region; but in their own account * they cite the fact that the base of the bog, containing tree roots, is exposed "a little below low-water mark," as an indication of a recent subsidence of the land; although they appear to recognize the possibility of explaining this phenomenon without invoking subsidence (pp. 26, 27). In his 'Acadian Geology' † Dawson mentions Gesner's paper, and seems to concur in that author's theory of recent progressive subsidence at Cascumpeque harbour.

In reviewing the two lines of evidence presented by Gesner as proofs of recent subsidence of Prince Edward island, we must examine each one separately and ascertain whether each is properly to be regarded as a reliable indication of coastal subsidence; and, if so, whether the

* J. W. Dawson and B. J. Harrington, 'Report on the Geological Structure and Mineral Resources of Prince Edward Island,' p. 51. Montreal, 1871.

† J. W. Dawson, 'Acadian Geology,' 3rd edit., p. 32. London, 1878.

subsidence is of recent date. Let us first consider the Black Bank peat deposit, and the bearing it has upon this interesting problem.

The south-eastern portion of Cascumpeque harbour is bordered by an extensive peat-bog, the monotony of whose level surface is relieved by occasional stunted conifers. In walking across it one's feet sink deep into the spongy moss which covers most of the area, and our attempts to run a peat sampler down into the deposit were often foiled by the presence of a layer of frozen peat 2 feet below the surface. This was the middle of June. The composition of the bog is well exposed on the north-east and north-west, however, for here the waves have cut well into it, forming lines of cliffs culminating in a northerly projecting cape or headland, and known as the Black Bank. The cliffs are steep, often vertical; and rising in places as much as 15 feet above sea-level, they present a striking appearance when seen from the water. From a distance the colour of the cliff varies from grey to dark brown or black, the grey predominating toward the top, where it may form a distinct band above the darker base. From top to base the bog seems to consist largely of sphagnum peat, with a layer of tree-stumps and roots at the base, and less prominent layers of smaller stumps and roots at higher levels. There can be no doubt that Gesner was correct in believing that this interesting sphagnum bog formed where we now see it, and that it did not slide down from higher land to its present position on the shore.

The height of the Black Bank cliffs does not represent the normal thickness of the peat deposit. Everywhere the surface of the bog rises distinctly as we go inland from the top of the cliffs. At first the rise is irregular and rapid, where the peat of the bog is badly cracked and broken along the shore, and the shoreward blocks of peat are lower than those next inland. Beyond the zone of breaking the surface rises gradually until the normal level of the bog is attained, some 6 or 7 feet higher than the top of the cliffs. This difference in elevation is not due to a rise of the ground under the bog, for tests with the sampler show that the bog itself actually increases in thickness back from the shore; nor is it due to removal of peat from beneath the margins of the bog by wave action, as careful inspection of the cliffs shows that all layers of the bog are preserved essentially intact. Neither can we admit that this difference in surface elevation was an original feature of the bog, due to a greater growth in the centre than around the edges, as is suggested by Dawson and Harrington; * for the cliffs are not located near the original edges of the bog, but have advanced well into what must have been its central portion; and there is, furthermore, distinct evidence of local compression or settling of the peat as one approaches any part of the cliff. The phenomenon is to be attributed to the lowering of the groundwater-level in the bog as a normal

* J. W. Dawson and B. J. Harrington, 'Report on the Geological Structure and Mineral Resources of Prince Edward Island,' pp. 25-26 (1871).

result of the encroaching wave attack, with the consequent settling of the peat. This simple effect of wave action may be illustrated by the following ideal sections (Figs. 2 and 3) through a portion of the Black Bank deposit, in the first of which is restored a supposed seaward limit of the bog :—

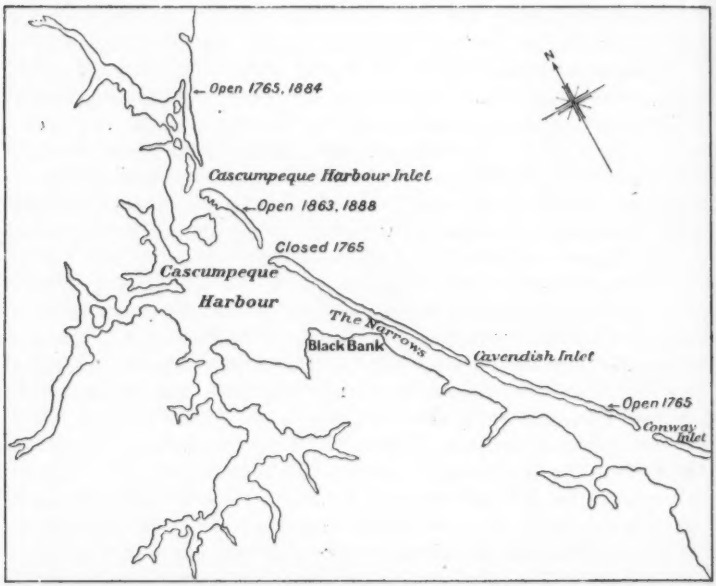
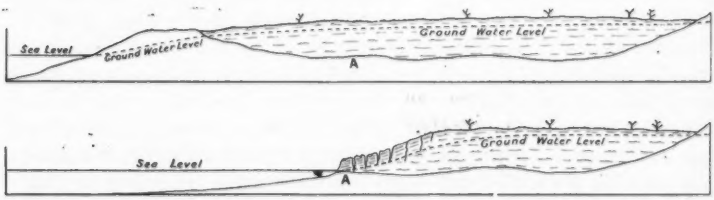


FIG. 1.—CASCUMPEQUE HARBOUR, ACCORDING TO THE WRIGHT MAP OF 1859. FIGURES ON THE MAP SHOW DATES OF OTHER MAPS WHICH REPRESENT CERTAIN INLETS AS OPEN OR CLOSED.



FIGS. 2 AND 3.—SECTION THROUGH A PORTION OF THE BLACK BANK DEPOSIT.

As shown by the diagram, the groundwater-level (G.W.L.) rises inland, but descends to meet the sea-level at the shore. If the shore is pushed inland to A, then the bog at this point suffers a lowering of the groundwater-level almost equal to the entire thickness of the bog ; and with the removal of the groundwater from the peat the latter undergoes such a

marked settling that the shoreward margin of the bog may represent but a fraction of its normal thickness. As will be pointed out below, the Black Bank bog appears to rest upon a rock platform which is practically at sea-level; but it is worthy of note that if the bottom of such a bog were to extend to or below low tide, on a shore having a large tidal range, the retrograding of the shore would reduce the groundwater-level of the bog practically to the low-tide mark at the immediate margin of the sea; and that the consequent settling of the peat might carry trees and stumps either on the surface or buried in the bog downward below mean sea-level. If the settling of the peat at the shore were intensified by compression due to the weight of a sand beach heaped upon it by the waves, and by the actual removal of fine, decomposed material from the peat by the ebbing tidal waters, it is evident that a fictitious appearance of marked subsidence might be created. This cause of apparent coastal subsidence, and the mistaken ideas as to change in the level of land and sea for which it has been responsible, are discussed in another paper.*

According to Gesner's description of the Black Bank, vertical cliffs of the peat extend 19 feet below low tide. This part of his description I find difficult to understand, for the base of the cliffs rests on a sandstone platform which is exposed just above or just below sea-level. I examined the cliff at many points throughout most of its course, both on the north-west and north-east exposures, and found no place where the base of the peat cliff was as much as a foot below low water, and in most places the contact of the peat with the underlying sandstone was above low-tide level. From the base of the north-west cliff the shore slopes off so gradually that even a small boat cannot reach the land, and the visitor must wade ashore. On the other side are "The Narrows," where the water is so shallow, according to the fishermen, that small motor boats cannot pass it at low tide. The fishermen state that there is no depth of water approaching 19 feet anywhere in the vicinity of the Black Bank, and the coast chart shows only very shallow water in that region. Soundings with the peat sampler at a number of places in the bog showed the presence of the sandstone at about the same elevation as at the cliff base. Dawson and Harrington describe the tree roots at the base of the deposit as "coming out from beneath the peat, and a little below low-water mark." † It is possible that Gesner found a deeper portion of the peat at some spot in the bog, or that he was misinformed as to the depth of the peat below sea-level. However this may be, it seems clear that as a whole the bog lies on a sandy base which is usually but slightly below sea-level.‡

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* D. W. Johnson, "Fixité de la Côte Atlantique de l'Amérique du Nord," *Annales de Géographie*, tome **21**, pp. 193–212 (1912).

† J. W. Dawson and B. J. Harrington, 'Report on the Geological Structure and Mineral Resources of Prince Edward Island,' p. 26 (1871).

‡ See also paper by J. W. Goldthwaite, in current volume of the *Bulletin* of the Victoria Memorial Museum, Ottawa.

The position of the Black Bank peat bog cannot safely be relied upon as an evidence of coastal subsidence. Even if the bottom of the depression which it occupies were originally a little below sea-level, and occupied by fresh water, the sphagnum would readily advance over the shallow pond, followed by tree growth, until the lower part of the present deposit was formed. The sphagnum would continue to grow upward, increasing the thickness of the bog just so long as the ground water-level would continue to rise enough to keep near the surface of the growing deposit. Under the weight of the overlying peat the first layer, with the remains of the earliest tree growth, would be pressed firmly down upon the underlying sandstone; and later cliffing of the deposit might reveal a great thickness of sphagnum peat with stumps at the base, resting on sandstone slightly below mean sea-level. If it be true that in places the sphagnum peat is 19 feet below low tide, it is still quite possible to account for its position without invoking coastal subsidence; for quaking bogs of sphagnum may cover the surfaces of deep ponds, and support a considerable tree growth, the remains of which will be carried downward as additional accumulations of vegetable matter build up the surfaces of the bogs. In view of these facts it is scarcely necessary to consider the age of the lowest part of the Black Bank bog to determine whether its formation was a recent phenomenon; but it may be pointed out that such bogs may represent a lapse of many centuries, or even of thousands of years. Hence, even if the position of the bog were a satisfactory indication of coastal subsidence, we could not safely infer that the subsidence was of recent date.

We come now to the consideration of phenomena of whose recency there can be no reasonable doubt. The sea flowing into groves of maple, beech, and birch, gradually killing them and causing them to fall down upon the marshes, can mean nothing else than a recent encroachment of the salt water upon areas formerly fresh. We have only to consider, therefore, whether such recent phenomena are reliable indications of coastal subsidence.

It has elsewhere * been shown that the phenomena here described may be produced by a change in the elevation of the high-tide surface as a result of changes in the form of the shoreline, independently of coastal subsidence. Where a bay is nearly separated from the sea by a bar or barrier beach, through which one or more narrow inlets constitute the only connection between the two bodies of water, high tide within the bay may be appreciably lower than high tide in the open sea. For as the tide rises outside, the water passing through the narrow inlet fills the bay inside so slowly that high tide outside is attained, and the water there falls appreciably before the inner bay has had a chance to fill. The high-tide surface of the bay is therefore lower than a corresponding surface in the

* D. W. Johnson, "The Supposed Recent Subsidence of the Massachusetts and New Jersey Coasts," *Science, N.S.*, **32**, pp. 721–723 (1910); "Fixité de la Côte Atlantique de l'Amérique du Nord," *Annales de Géographie*, tome **21**, pp. 193–212 (1912).

adjacent part of the open sea. It is evident, however, that if a new inlet is opened, or if former inlets are enlarged, more water can enter the bay in a given time, and the level of the high-tide surface within the bay will rise. Such a rise will produce locally all the phenomena which would result if the land had actually subsided by an amount equal to the rise of the high-tide surface. Fresh-water marshes will be invaded by salt water, trees will be killed, the salt marsh will build up to the new high-tide level, salt water will ascend the rivers farther than before, and many other changes will result. So far as appearances are concerned, no one could discriminate between such phenomena produced by a local rise in the high-tide surface and the same phenomena produced by actual coastal subsidence. The local effects are identical in both cases. Only by an examination of the local physiography to determine whether conditions favour changes in the height of the high-tide surface, and by a comparison with adjacent areas, to ascertain whether the phenomena are widespread, can we hope to reach a satisfactory decision as to whether such recent phenomena result from local tidal fluctuations or from widespread coastal subsidence.

There can be no doubt that the conditions at Cascumpeque harbour are favourable to fluctuations in the height of the high-tide surface within the bay. The harbour or bay is separated from the open water of the Gulf of St. Lawrence by a barrier beach, through which several inlets now connect the two bodies of water. Such inlets are well known to be inconstant in number, size, and position, and it seems inevitable that the height of high tide within the harbour must have changed from time to time with past changes in the inlets. With a tidal range of 3 feet or more outside the barrier beach, fluctuations of at least a foot in the average height of high tide within the harbour may have occurred within the last century.

The present aspect of the barrier beach is strongly suggestive of past changes in the position of inlets. In places the barrier consists of successive dune ridges, the back ones being well forested, and representing a relatively permanent part of the beach. Elsewhere the barrier is covered with grass only, while in still other places it consists of a low, sandy flat, barren of vegetation. Judging from experience gained on other beaches, the low bare patches probably represent old inlets which have been filled up at a comparatively recent period.

The testimony of old inhabitants of the region confirms the physiographical evidence of changeable inlets. According to a citizen of Alberton, whose knowledge of the barrier beach dates back fifty years, there have been times when some of the inlets now open have been closed. He gave dates for the opening and closing of certain inlets, and stated that there are now in existence inlets not shown on recent maps of the region. At the time of my visit there was an inlet through the barrier some distance south-east of the Black Bank cliffs, not shown on the map. This inlet had

been opened about five years before, according to the fisherman who accompanied me, and who stated that prior to its opening there was a continuous stretch of unbroken beach for 5 miles north-west from Cavendish inlet. On a "Plan of the Island of St. John" (Prince Edward island), based on surveys by Captain Holland, and dated 1765, no inlets are shown between Cavendish inlet and the main entrance to "Holland Bay" (Cascumpeque harbour), north of Savage island. This doubtless correctly represents the conditions at that time, for the map is quite detailed as to shore features, gives many soundings, and appears to be reasonably accurate. The "Hydrographic Chart of Prince Edward Island and Adjacent Coasts," published by the U.S. Navy Department in 1888, shows two additional inlets between these same points. On the other hand, one inlet into the northern part of the harbour, and another into the Narrows, east of Conway inlet, prominently shown by the Holland map, do not appear on the Hydrographic Chart. All the evidence agrees in indicating the existence of conditions which must have produced fluctuations of high-tide level within the harbour during recent times. As these fluctuations must have brought occasional disaster to the trees growing close to the water's edge within the harbour, we may now examine the shores of the harbour to see if the effects are on such a scale as readily to be attributed to changes in the tidal regions, due to changes in the form of the shoreline.

So far as my observations extended, and according to the testimony of the fishermen, the two localities showing the most pronounced invasion of fresh vegetation by salt water at the present time are along the mainland shore of the Narrows, south-east of Black Bank, and on the barrier beach near the main entrance to Cascumpeque harbour. Walking along the mainland shore of the Narrows, the observer is favoured with a fine exhibition of trees and bushes which are either dead or dying as a result of salt water invasion. At first sight this suggests a gradual submergence of the land; but off to the eastward one notes the gap in the protecting line of the barrier beach said to have been made some five years ago, and through the opening sees the form of mighty breakers. May it not be that there is some casual relation between the recent break in the barrier and the dying vegetation?

An examination of the mainland shore shows that it is very low and flat, so that a rise of but a few inches in tidal height would carry the salt water into the marginal area of trees and bushes. Only a narrow marginal zone of trees and bushes are dying. The low, flat shore is being "nipped" as if by a recent revival of wave activity, such as might be produced by raising the zone of wave attack a few inches. A part of the disaster which is overtaking the vegetation is evidently due to the cliffing of the shore, by which the roots of the trees are exposed to salt water as the soil is removed from about them; but it is probable that a slight rise of the high-tide level is responsible both for the renewed cliffing and for actual

invasion of fresh-water areas by salt water. In a shallow body of water like the Narrows, a rise of even an inch or two in the average height of high tide means more water and bigger waves; and the larger waves may invade the areas of fresh-water vegetation and produce effects which seem out of all proportion to the initial cause. A new inlet in the barrier beach, or the widening of an old inlet, is fully competent to produce such a change in the high-tide level in the Narrows as will fully explain the dead and dying vegetation of that part of the shore. Similar phenomena, evidently due to the same cause, are of frequent occurrence at points along the Atlantic coast, as will be set forth in detail in a later report; and the killing of the trees, described by Gesner, a local phenomenon at Cascumpeque harbour, doubtless represents the effect of one of the earlier breaches in the barrier reef in front of that harbour.

Along the northern portion of the coast of New Jersey are some bays which are similar to Cascumpeque harbour in origin, but whose recent history has been in some respects different. The bay known locally as Navesink river was, not long ago, quite open to the sea, so that the tides could freely enter its broad mouth. To-day a barrier beach separates the bay from the ocean, and as there are no inlets through the beach in this region the connection between bay and ocean is an indirect and narrow channel leading northward towards Sandy Hook. As a result of this condition of affairs, the high-tide surface in Navesink river is lower than formerly, whereas at Cascumpeque harbour the reverse is the case. Instead of a fringe of dying vegetation about the shores of the Navesink river, we find that cliffs formerly attacked by the waves of this bay are overgrown with fresh-water vegetation, and that such vegetation even flourishes part way down the beach at the foot of these abandoned cliffs. At Cascumpeque harbour not only do we find the dying vegetation already described, but the shores of the harbour and of the islands in the harbour present many low cliffs of bare red sandstone, due to a wave attack whose vigour may well have been renewed with the opening of the inlets in the barrier beach. At Navesink river we have apparent elevation, at Cascumpeque harbour apparent subsidence, both due to local changes in high-tide level.

On the south-east side of the main entrance to Cascumpeque harbour, the barrier beach terminates in a poorly formed spit curving into the harbour. On this spit are a series of dune ridges separated by low swales, indicating successive additions to its area. Some of the ridges and swales are sharply truncated by a newer set, and these in turn are themselves cut across by the present shoreline. Evidently there have been considerable changes in the form and position of this part of the barrier beach series, and consequently in the adjacent inlet. Still more interesting, however, is the devastation wrought among the trees on the seaward side of the beach as a result of normal shoreline retreat under continued wave attack. Of the ridges and swales truncated by the present shoreline, the north-westerly or later ones are covered with grass, while the south-easterly or older ones

are forested. The fact that these ridges and swales are abruptly cut off by the present shore is sufficient proof that the waves have been driving the shoreline landward. That this process is actively going on is shown in a most interesting manner. Where the forested ridges approach the outer shore their form is destroyed or masked by quantities of the red beach sand which the waves have driven into the edge of the forest, burying the bases of the trees and partially filling up the seaward ends of the swales. Salt water not only saturates the sand at every storm, but passes into the swales to form salt ponds which may stand for some time in the depressions. Trees that were formerly protected from salt water by the ridges and swales in front of them, are now succumbing to the "flank attack" of the sea. A more desolate scene can scarcely be imagined than that afforded by the ghostly trunks of the dead trees standing in the barren waste of red sand under a stormy sky.

There is no reason for considering the death of these trees as in any way related to a subsidence of the land, or even to a change in the high-tide level. If the shore were to build forward again, so that the area of dead trees was again protected by a series of dunes and swales parallel to the shoreline, the spot would again become forested, without requiring any change in the relative level of land and sea. Fresh-water vegetation will always grow closer to high-tide level in a protected area than in an area exposed to storm waves. If changes in the position of the shoreline bring protected areas into an exposed position, a certain zone of fresh-water vegetation must be killed, whether or not there has been any subsidence of the land.

There are some who maintain that the very fact that waves cut into the land is of itself a proof of coastal subsidence. To fully answer this argument requires a careful analysis of the cycle of shoreline development, an analysis too long to be included in this paper. It is sufficient to say here that both theoretical considerations and the facts of field evidence support the theory that waves will cut into a land mass exposed to their attack, whether the land mass be sinking or not.

We have seen that neither the position of the Black Bank peat bog nor the death of the vegetation along the shores affords satisfactory evidence of coastal subsidence at Cascumpeque harbour. The fact that the phenomena we have been considering may be explained without invoking subsidence does not, however, preclude the possibility that coastal subsidence has been taking place. I have therefore sought for more satisfactory evidence of subsidence, stability, or elevation, and will briefly consider such evidence as was found.

Stumps, partly submerged even at low tide, were seen along parts of the bay shore. Although these stumps appeared to be in place, they were associated with others lying on their sides; and still others were in an upright position on the surface of the beach, and even on the fresh sod above high-tide mark, where they had been stranded by some storm.

FIG. 4.—FOREST BEING KILLED BY NORMAL RETROGRESSION OF SHORELINE. OUTER SHORE OF BAR AT MOUTH OF CASCUMPEQUE HARBOUR.

FIG. 5.—THE BLACK BANK PEAT DEPOSIT, SHOWING SETTLING OR COMPRESSION OF PEAT NEAR WAVE-CUT MARGINS THE MAN IS STANDING ON BED-ROCK.

Evidently upright stumps are not necessarily stumps *in situ*, and in the present instance one could not be sure that any of the stumps were in their original positions. Most of those seen were near the Black Bank, and doubtless came from the basal portion of that deposit. In any case they cannot be relied upon as evidence of coastal subsidence.

Of the dune ridges on the barrier beach, described in a previous paragraph, those which seem to be the oldest are several feet lower than the later ones. Coastal subsidence would carry downward those ridges first formed, and give rise to this inequality in the elevation. But there are other causes equally capable of producing this same phenomena. Variations in the quantity of *débris* available for wave work, in the rate at which the material is supplied, in the general shape of the shore, and initial irregularities in the submarine surface are among the factors which will result in variations of altitude of beach ridges and dune ridges. This phase of shoreline development will be discussed in full in another connection, where considerations will be presented to show that the earliest ridges formed on a stable coast are apt to be of lower altitude than those which formed later; and hence that such difference of altitude is not an evidence of coastal subsidence.

The later ridges on the beach described above are of fairly equal height, but are too few in number and too restricted in areal extent to afford any proof of long-continued coastal stability. We must look beyond the limits of Cascumpeque harbour for reliable proof of either progressive substance or coastal stability.

That the death of the vegetation around the shores of Cascumpeque harbour has resulted from a local change in high-tide level is clearly indicated by the general absence of similar phenomena along other portions of the Prince Edward island coast. While dead and dying vegetation will undoubtedly be found here and there along the shore where local conditions favour undermining of trees, variations of tide-level, and other local changes, the conditions of Cascumpeque harbour were sufficiently unique to call for special treatment by Gesner. He speaks of the "sinking" at this point as being "more recent than any other that met his observation" (p. 387). Gesner believed that one small area might sink while adjacent areas were rising, and he therefore describes many "sinkings" with intervening "elevations" all along the coast from New Jersey to Labrador. In the light of our present knowledge we can find a more satisfactory explanation for many of the phenomena he described in local changes of high-tide level, causing apparent elevation in some places and apparent subsidence in others.

It is not the object of this paper to discuss in detail the questions as to whether or not the coast of Eastern Canada as a whole has been subsiding in recent times. That is too large a question to deal with in the limits of the present article. It may be noted, however, that the absence of anything approaching a continuous fringe of dead trees about Prince Edward

island is a very good indication that there has been no marked general subsidence in this region in recent times. There is, furthermore, good reason for believing that the whole Atlantic coastline, from the Gaspé peninsula to the Florida Keys, has enjoyed a period of approximate stability for several thousand years at least. The elaboration of this thesis forms the subject-matter of the Second Shaler Memorial Report, of which the present paper is an extract dealing with but one locality.

THE CAPTAIN SCOTT FUND.

A STATEMENT regarding the proposed apportionment of this fund to the various objects for which it has been raised was issued by the Mansion House Committee early in July. By contributions in this country and throughout the empire the fund has reached a total of £75,000, and this is to be used, firstly, to supplement the grants made by Government to the widows and orphans of the lost explorers; secondly, to clear off the deficit on the expenses of the expedition; thirdly, for the publication of the scientific results; and fourthly, for the provision of a suitable memorial to Captain Scott and his comrades.

For the first object the sum of £34,000 has been set aside, and will be allocated as follows:—

Lady Scott	£8500
Peter Scott	3500
Mrs. Scott and her two daughters	6000
Mrs. Wilson	8500
Mrs. Bowers and her two daughters	4500
Mrs. Evans and her three children	1250
The mother of Edgar Evans	250
Mrs. Brissenden and her child	750
Mrs. Abbott	750

Mrs. Brissenden is the widow of a sailor belonging to the expedition who was accidentally drowned when engaged in survey work in New Zealand; and Mrs. Abbott is the dependent mother of a Chief Petty Officer who has become insane as a result of the privations endured. Special arrangements have been made as to the ultimate disposal of certain of the grants.

The sum of £5000 is required to clear off the deficit on the expenses of the expedition.

For the publication of the scientific results of the expedition the sum of £17,500 has been set apart, of which £8700 has been provisionally allocated to salaries, fees, etc., of experts engaged for the work, and the remainder for actual expenses of publication, including paper, printing, engraving, binding and distribution. No grant is made for the biological division, which has been undertaken by the Trustees of the British Museum. The work of publication will be controlled by a committee of

three members, Sir Archibald Geikie, appointed by the Royal Society, Major Leonard Darwin by the Royal Geographical Society, and Staff-Surgeon E. L. Atkinson, R.N., as representing the scientific staff of the expedition. Captain H. G. Lyons, F.R.S., Hon. Secretary of this Society, has consented to undertake, without salary, the editorial charge of the preparation and publication of the scientific results.

For the last object—the provision of a memorial—the sum of £18,000 is available, and in regard to this the committee recommend—

(1) The provision of a suitable memorial tablet in bronze in St. Paul's Cathedral, sanction for this having been given by the Dean and Chapter.

(2) The erection of a sculptured monument in bronze in a public space in London (preferably the space immediately behind the railings in Hyde Park, fronting the new home of the Royal Geographical Society), to contain the figures of the five dead men, by a sculptor of approved eminence to be hereafter selected.

(3) The balance—estimated at £10,000—to be placed in the hands of trustees and devoted to an Endowment Fund in aid of future Polar research; this being an object which it is believed would have commended itself greatly to the late Captain Scott.

The committee also propose to make a contribution to the special memorial to the late Captain Oates now being raised by his regiment, his relatives not requiring assistance from the nation or the fund.

STATISTICAL STUDY OF WHEAT CULTIVATION AND TRADE, 1881-1910.*

By J. F. UNSTEAD, M.A., D.Sc.

Aim of the Inquiry.—Any study in economic geography which may lay claim to authority or accuracy must be based upon statistical data; these may be expressed simply by figures, they may be reduced to words, or they may be given form as diagrams or maps. This is obvious in the case of studies dealing with such matters as the productive capacities of countries, or the size and economic activities of cities; it is equally true although less obvious in studies dealing with the situations and advantages of commercial routes, for the maps upon which these are shown are themselves based upon the statistical data of the surveyor, and the facts deduced from the map may have to be reconverted into numerical form by the student.

The problems connected with the cultivation, import or export, and consumption of wheat are of the first importance in many countries, and should therefore be based as far as possible upon statistical data, for only so far as the knowledge is of this kind can it be considered accurate and the conclusions drawn from it be accepted as trustworthy. The present paper, therefore, aims at presenting in a convenient form all the available statistics relating to the quantities of wheat

* Royal Geographical Society, May 22, 1913.

produced, imported or exported, and consumed in the various countries. As each country is considered the statistics are given, some of the problems connected with them are indicated or discussed, and occasionally, where the data seem adequate, definite conclusions are drawn.

Quantities only are dealt with: prices are not here given or discussed, for they are determined by many factors beside the cultivation of and trade in wheat, and to deal adequately with them would require a separate treatment for which this paper supplies part of the necessary material. For similar reasons, questions relating to the duties upon wheat or flour and those relating to the use of foods other than wheat have, with one or two simple exceptions, also been omitted.

Explanation of the Headings of the Tables.—In regard to most countries the original statistics give (1) *the area sown* with wheat; (2) *the total production*; (3) *the total imports and exports* of grain and flour respectively. From these other facts may be obtained, and those which are of greatest importance have been worked out and are included in the tabular statements. (See Table 3, which may be taken as typical.) (1) *The average yield per acre* has been obtained from the area and production. (2) The *net import* or *net export* has been calculated and is substituted for the total imports and total exports, which are relatively unimportant. (3) The trade being partly in the form of grain and partly in the form of flour, the amounts of flour have therefore been converted into amounts of "equivalent grain" according to the practice of the Board of Trade by which 72 bushels of flour are assumed to be milled from 100 bushels of grain; the net import or net export is expressed in terms of grain, but also the *proportion imported or exported in the form of flour* has been calculated and is expressed as a percentage, which serves as an index of the importance of the milling industry in the various countries. (4) In the case of importing countries the *amount consumed* by the population has been obtained by adding the imports to the production, after a deduction has been made for the quantity of grain required as seed for the next harvest. This quantity varies considerably: thus, following Gilbert and Lawes (*Journal of the Royal Agricultural Society*, 1893), 2 bushels per acre sown are deducted in the case of the United Kingdom; following Kaerger (*Journal of Political Economy*, 1902), 2¼ bushels per acre are deducted in the case of the German Empire, and 1 bushel in the case of the Argentine Republic; following the practice of the United States Department of Agriculture, 1½ bushels are deducted where no other estimate is available. (5) In the case of importing countries the *proportion of the total supply which is imported* has been calculated and expressed as a percentage. (6) In the case of exporting countries, the *amount consumed* has been obtained by deducting the net export and the seed requirements from the total production. Table 12 may be referred to as a typical example. (7) In the case of exporting countries, the *proportion of the total production which is exported* is expressed as a percentage. (8) The *amount consumed per head* has been calculated from the total consumption and the population.

It is hoped that the statistics thus calculated and expressed will be those most generally useful for the various purposes of the economist and the geographer.

Reliability of the Data.—The original statistics here utilized may be divided into three classes: the returns collected by governments as the result of direct inquiries; the estimates made by governments from incomplete data; the unofficial estimates made in the interests of farmers or traders. Statistics of the first class are subject to errors of various kinds, but unless there is some definite evidence to the contrary they must be accepted, statistics of the second class cannot be relied upon to the same extent, while as a rule those of the third class must be accepted with reserve and only in the absence of more trustworthy data.

As the statistics relate to a period of thirty years, it may happen that in the case of some countries actual returns are given only for a portion of the period or perhaps merely for particular years, as, for example, the decennial census years; for the remaining years estimates, either official or unofficial, must be employed. In some instances, indeed, actual returns are seldom made, and the estimates for other years are possibly contradictory. Thus in collating the various sources of information, the writer has had both to sift and to weigh the returns and estimates. Occasionally a gap in the returns is of little consequence, as interpolation may be simple, and the final result is not seriously invalidated. In other cases gaps may be larger or repeated, and interpolation fails. Again, two estimates made upon different evidence or by different methods may agree, and their value at once becomes considerably greater than if one estimate only is available. The amount of evidence is far too great to be given in detail, and the conclusions are too numerous to have explanations attached; the writer has therefore attempted to indicate the relative value of the final statistics published in this paper by the use of different kinds of type; ordinary type is used for statistics in which the margin of error is thought to be small, *e.g.* those based entirely or almost entirely upon actual official returns, whose accuracy has not been challenged; figures in italic type are used for those where there is an appreciable margin of error due either to the incompleteness or uncertainty of the returns or estimates; figures in italic type enclosed in brackets are employed for mere estimates upon which, when they stand alone, definite conclusions can seldom be based, *e.g.* such estimates of the production of single countries are useful mainly in calculating the production of the whole world, for in that case their errors are small in relation to the total amount, and are likely to cancel one another.

Authorities.—Wherever it has been possible, the original returns of the various countries have been utilized. In other cases the data have been obtained from periodical returns compiled by one government from those of other countries; in this connection the British *Statistical Abstract for Foreign Countries* and the *Statistical Abstract for the Colonies* have been largely used, as also the *Getreide im Weltverkehr* of the Austrian Ministry of Agriculture. Into the same group are to be placed special reports of various governments in which statistics have been given, and equally trustworthy are the returns collected by the International Institute of Agriculture in Rome. Somewhat similar are the *Agricultural Statistics* collected by the Department of Agriculture of the United States and the *Getreideernte der Welt* of the Hungarian Ministry of Agriculture, but in these compilations estimates as well as returns are included. In a few instances the series of the *Statesman's Year Book* has yielded data otherwise inaccessible, and commercial estimates have been obtained from the several issues of Broomhall's *Corn Trade Year Book*.

The Units Adopted.—Wheat is measured both by weight (*e.g.* in English measures, usually in cwts.) and by volume (*e.g.* in bushels and quarters). The unit adopted in this paper is the bushel, both because it is most commonly used in this country and in America, and also because quantities expressed in it can be simply reduced to quarters. In some countries the statistics are given in other measures of volume and the reduction in these cases is simple, but in other countries the amounts are expressed in weights and the problem of relating weights to volumes then arises. No definite relation between weights and volume can be established, for the weight of a given volume of wheat varies according to the variety and condition of the wheat. On an average, Russian spring wheat weighs about 57 lbs. to the bushel, whereas Californian wheat may weigh nearly 63 lbs. to the bushel. These, however, are rather extreme cases and most wheat weighs

somewhat more or less than 60 lbs. to the bushel. Therefore the statistics given in measures of weight have been reduced to bushels on the assumption that 60 lbs. are equivalent to 1 bushel.

Here, then, is a small possibility of error additional to those arising from the incompleteness or inaccuracy of the original data. It would therefore be absurd to give the statistics in full, to the actual bushel, and for most purposes a million bushels is a satisfactory unit; hence the figures have been calculated to the nearest million bushels. Only in two sets of figures have bushels been retained throughout as the units, namely, in the average yield per acre and the average consumption per head. In regard to the area sown, the various measures have been reduced to acres, and to bring the approximation into harmony with that adopted in regard to quantities of wheat the areas have been calculated in millions of acres, but as, on the average, a million bushels of wheat would be produced from one-tenth of a million acres the calculations have been worked out to tenths of a million acres. By using such large units a considerable saving of space is effected and the figures can be more easily grasped, while the relative importance of the regions and the significant changes during the period are adequately shown.

The Period and its Sub-Divisions.—The student of geography who examines and describes only present conditions does no more than open his eyes and immediately shut them again: he has no conception of the movements and developments of which the present conditions are merely a passing phase. To see things in motion should be the aim throughout the range of geography, and therefore this inquiry extends over a fairly wide period. Before 1881 there were but few statistics relating to wheat production; for example, in our own country the returns go back only to 1884 and for the preceding years there are but estimates; moreover, the movements which took place before 1880 have an historical interest rather than a close connection with the developments of to-day. This is exemplified by the contrast between the rapid increase in the exports of the United States in the seventies of the nineteenth century on the one hand, and on the other the decrease which became marked at the beginning of the twentieth century and is now one of the important factors to be taken into account in estimating the present tendencies.

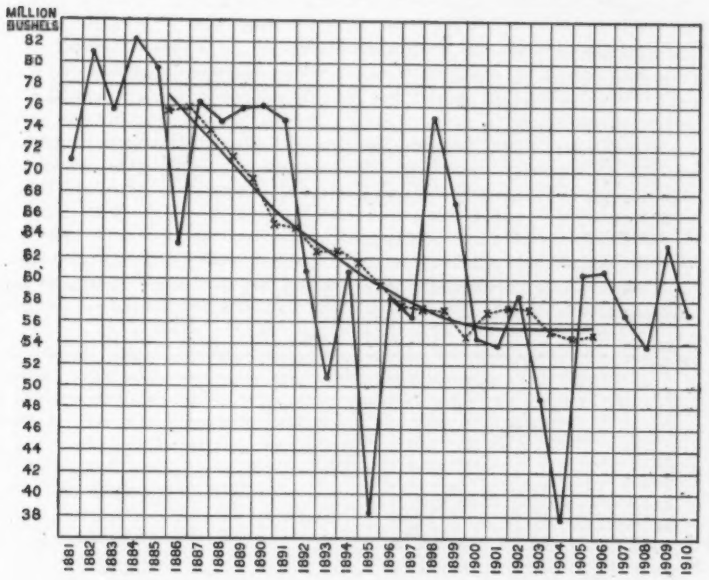
If the returns of each year were given, the figures would be too numerous and too fluctuating for the great developments to be appreciated. Harvests and the trade which depends upon harvests vary so greatly from year to year that by some method averages must be obtained in which the abnormally good and the abnormally bad harvests are balanced one against another, and the first problem is to find the number of years which it is necessary to take together to get a result free from the disturbing influences of weather conditions. The duration of this short period must vary according to the phenomena studied; it is necessary to determine it independently in each inquiry. Here the fundamental variation is that of the production of wheat and so a series of figures showing the production of wheat may be examined from this point of view. Those relating to the harvests of the British Isles from 1881 to 1910 are given in the following table.

The fluctuations are considerable; the harvests range from 82 million bushels in 1884 to 38 million bushels in 1895 and in 1904. It is evident that on the whole the harvests became less, but to see this tendency clearly and to examine it more carefully a graphic method may be employed.

UNITED KINGDOM.

TABLE I.

Year.	Acres sown.	Harvest.	Net import.	Year.	Acres sown.	Harvest.	Net import.	Year.	Acres sown.	Harvest.	Net import.
	Million.	Million bushels.			Million.	Million bushels.			Million.	Million bushels.	
1881	3·0	*71*	133	1891	2·4	75	165	1901	1·7	54	186
1882	3·2	*81*	151	1892	2·3	61	176	1902	1·8	58	200
1883	2·7	*76*	160	1893	2·0	51	173	1903	1·6	49	217
1884	2·7	82	125	1894	2·0	61	179	1904	1·4	38	219
1885	2·6	80	154	1895	1·5	38	198	1905	1·8	60	212
1886	2·4	63	124	1896	1·7	58	184	1906	1·8	61	208
1887	2·4	76	149	1897	1·9	56	163	1907	1·7	57	214
1888	2·7	74	149	1898	2·2	75	173	1908	1·7	54	201
1889	2·5	76	145	1899	2·1	67	180	1909	1·9	63	210
1890	2·5	76	152	1900	1·9	54	181	1910	1·9	57	220



PRODUCTION OF WHEAT IN THE UNITED KINGDOM, 1881–1910.

DIAGRAM I.

Production of Wheat in the United Kingdom, 1881–1910.

In this diagram the amounts of the successive harvests are shown by the position of the dots, and their fluctuations are shown by the changing directions of the continuous straight lines joining the dots. The crosses represent the averages of the harvests for ten years: thus the first cross, which indicates a little less than

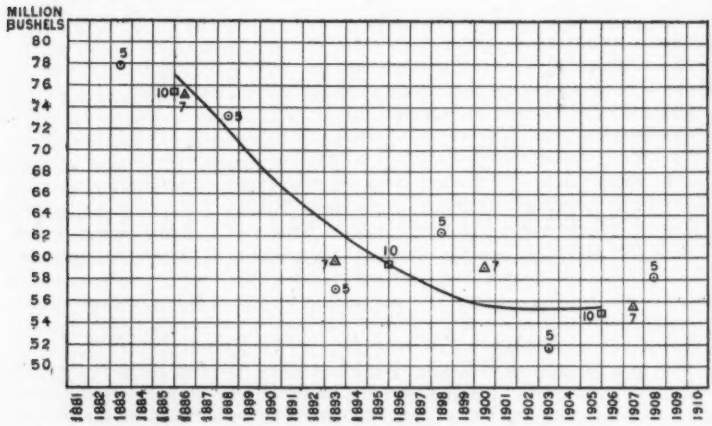
76 million bushels, shows the average of the harvests from 1881 to 1890 and is placed midway between these two dates; the second cross, which indicates an average of exactly 76 million bushels, relates to the period 1882–1891, while the third cross shows that the average was 74 million bushels for the period 1883–1892. These crosses are joined by dotted lines, the risings and fallings of which show that even yet the effects of good and bad harvests are not quite eliminated. Therefore to complete this elimination a "smooth curve" is constructed so as to occupy a position between the higher and lower portions of the dotted lines; this "smooth curve" is drawn in a firm line which shows the general tendency of wheat production in these islands, viz. that there was a pronounced decrease during the first part of the period, that later the decrease gradually became less, and that at present the decrease has ceased and the production is about stationary.

Neither time nor space would permit of this method being applied to all the statistics concerned; hence this method of the smooth curve is used here only to determine the best period for an arithmetical average, for it affords a criterion as to the general tendency with which various averages may be compared. These averages are shown in the following table:—

TABLE H.—Wheat Production in the United Kingdom, 1881–1910.

Five-year averages.		Seven-year averages.		Ten-year averages.	
Period.	Million bushels.	Period.	Million bushels.	Period.	Million bushels.
1881–1885	78	1882–1888	75	1881–1890	76
1886–1890	73	1889–1895	60	1891–1900	60
1891–1895	57	1896–1902	59	1901–1910	55
1896–1900	62	1903–1909	55	—	—
1901–1905	54	—	—	—	—
1906–1910	58	—	—	—	—

These averages are compared with the complete and true indication of the smooth curve in Diagram 2.



A COMPARISON BETWEEN FIVE-, SEVEN-, AND TEN-YEAR AVERAGES.

DIAGRAM II.

The five-year averages are shown by small circles against which the figure 5 is placed. The fluctuations of these averages show that the effects of particular harvests are not eliminated; thus the third and fifth averages are pulled down by the bad harvests of 1895 and 1904 respectively, while the fourth average is raised by the extraordinarily good harvest of 1898; the general tendency cannot be seen by an examination of these figures alone. It is therefore useless to employ a five-year average in this problem of wheat production.

Seven-year averages may at first seem to have eliminated the effects of particular seasons, but they are perhaps the more dangerous on that account, for if relied upon they would lead to an incorrect conclusion. For the four short periods the figures are: 75, 60, 59 and 55 million bushels; they suggest, therefore, that in the first part of the whole period there was a marked decrease in the production, that in the second part the decrease ceased and the production remained stationary, and that in the last part the decrease again asserted itself and is a feature of the present conditions. The fact is that again the figures for the second and last periods are depressed by the bad harvests of 1895 and 1904, while that of the third period is raised by the good harvest of 1898.

The ten-year averages, read in the same way as 76, 60, and 55 million bushels, would indicate that in the earlier part of the period there was a great decrease, and that the decrease became considerably less marked in the later part. This is true, and although it is not the whole truth it is the nearest approach to the whole truth that can be obtained by any arithmetical average. Consequently, five-year and seven-year averages are rejected, and the whole period from 1881 is divided into the three ten-year periods ending in 1890, 1900 and 1910 respectively.

Order and Treatment of Regions.—The various regions have to be considered in the first place as political units, since the statistics are collected in such units. In some cases, as in the Scandinavian, Iberian and Balkan peninsulas, the political units are then combined; in other cases, as in the United States, the total production is analyzed and smaller units are obtained, though political areas still form the basis of the division and the data are lacking for a division into natural or geographical units. Finally, the statistics of the various regions are collected together and a brief survey of world developments is made.

The detailed order of treatment of the various countries is shown below, to facilitate reference to particular tables.

Europe—

United Kingdom	Tables 1–5.
France	Table 6.
German Empire	Table 7.
Austria-Hungary	Tables 8–10.
Russian Empire	Tables 11–12.
Scandinavia—Norway	Table 13.
Sweden	Table 14.
Iberian Peninsula—Spain	Table 15.
Portugal	Table 16.
Italian Peninsula...	Table 17.
Balkan Peninsula—Bulgaria	Table 18.
Servia	Table 19.
Greece	Table 20.
Turkey	Table 21.

Europe—*continued.*
Smaller States—Roumania ... ... Table 22.
Belgium ... ... Table 23.
Holland ... ... Table 24.
Switzerland ... ... Table 25.
Denmark ... ... Table 26.
Asia—
India ... ... Table 27.
Japan ... ... Table 28.
China ... ... —
Persia ... ... —
Turkey in Asia ... ... —
North America—United States ... ... Tables 29–32.
Dominion of Canada ... ... Tables 33–36.
Mexico ... ... —
South America—Argentina ... ... Table 37.
Uruguay ... ... Table 38.
Chili ... ... Table 39.
Africa—Algeria ... ... Table 40.
Tunis ... ... —
Egypt ... ... Table 41.
Union of South Africa ... ... Table 42.
Australasia—Commonwealth of Australia ... ... Tables 43–44.
New Zealand ... ... Table 45.
The whole World ... ... Table 46.

THE UNITED KINGDOM.—The following table gives the results of the ten-year averages relating to the United Kingdom:—

TABLE III.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and wheat flour.	Percentage of wheat flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels	Bushels.	
1881–90	2·7	28	76	5	144	27	215	6·0	67
1891–00	2·0	30	60	4	177	29	233	5·9	76
1901–10	1·7	32	55	3	209	19	261	6·0	80

Considering first the area sown with wheat, it appears to have undergone changes somewhat similar to those of the total production in so far as the decrease was very marked in the earlier part of the period and much less in the later part, but the total reduction in acreage is about 37 per cent., while the total reduction in produce is about 27 per cent. In other words, the yield per acre became greater and to some extent made up for the reduction in acreage. The yield per acre increased in a fairly uniform manner from 28 to 30, and from 30 to 32 bushels per acre. Among the causes of this increase two are important and need to be carefully distinguished. A decrease in acreage would presumably be brought about by the withdrawal of the poorer wheatlands; the result would be that although the yield of the remainder would be unaffected, the arithmetical average would stand higher. If this were the sole cause of the increased average an

estimate of future developments would have to assume that this increase will become less as the decrease in acreage is now becoming less. But the increase in yield has apparently been maintained during the whole period in spite of the lessening of the decrease in acreage, and so another cause must be operative; this is doubtless to be found in the various improvements in methods of cultivation. These improvements have become manifold in recent years: the selection and breeding of varieties which give higher yields and are less subject to diseases, the adoption of better methods of improving the physical condition of the soil, the application of more suitable manures, and the invention of mechanical means of sowing and reaping are among the common developments of agricultural practice in this country. In other lands, where marginal climatic conditions are experienced, to these developments must be added the introduction of entirely new varieties, alterations in the times of sowing and reaping, the adoption of artificial means of adding to or retaining water in the soil and, where insect pests or fungus have caused great damage, the employment of scientific methods and wide-spread co-operation in combating these pests. Since these developments are still proceeding, and there is every indication that scientific research will play an increasingly large part in directing agricultural practice, there is a strong probability that the increase in yield will be maintained even were the acreage not further reduced.

The decrease in the home production has been accompanied by a steady increase in the amount imported, with the result that whereas in the first part of the period two-thirds of the total supplies were obtained from abroad, the proportion rose first to three-quarters and then to four-fifths. However, because the decrease in the home production gradually became less the increase in the proportion imported similarly became less. To obtain an estimate of the extent to which the country may in future be dependent upon foreign supplies, the following facts may be borne in mind: the acreage under wheat is decreasing, although less rapidly than at an earlier period; the yield per acre is steadily increasing—in the later part of the period at the rate of about 7 per cent. in ten years; at the same time, the population is more rapidly increasing—in the later part of the period at the rate of about 10 per cent. in ten years. Consequently there is every probability that the proportion of the total supply which is imported will become still greater.

Before examining the sources from which the overseas supply has been obtained, attention may be drawn to two other facts shown by the table. The first is that the average consumption per head of the population appears not to have changed to an appreciable extent; it must be remembered, however, that the figures relating to the consumption are based upon these giving production, imports, and the number of the population, and only where these returns are all trustworthy can such a complex statement as that of the consumption per head be accepted without question. In this case no question arises, for other sources of knowledge justify the statement that the British people have not changed their habits in regard to the use of wheat as a food, and the accuracy both of the original data and of the methods of calculation is to that extent confirmed. The second fact is that the percentage of flour imported has decreased very considerably during the twentieth century—a clear indication of the increased activity in the milling industry, for the figures show that in the period 1891–1900 an average amount of 182 million bushels per annum was milled in this country and in the period 1901–1910 the amount had increased to 221 million bushels, or an increase of over 20 per cent.

TABLE IV.—Chief Sources of Import into the United Kingdom.

The upper figure in each pair represents the amount (in millions of bushels) exported to the United Kingdom, the lower figure the net exports to all countries.

	From the British Empire.				From Foreign Countries.					
Period.	India.	Canada.	Australia.	Total from British Empire.	United States.	Argentina.	Russia.	Roumania.	Austria-Hungary.	Total from all Foreign Countries.
1881–90	17/35	6/7	6/6	29	74/116	1/4	32/32	2/21	4/11	116
1891–00	12/23	12/13	4/4	28	101/178	15/37	23/104	2/7	3/1	151
1901–10	27/37	26/42	15/28	68	68/125	34/84	29/142	3/42	1/−3	142

In this table the chief sources of the importation of wheat are exhibited. The first column shows that the quantity coming from India has varied considerably. In the first period India supplied 17 million bushels, while in the second period the amount dropped to 12 million bushels. Some explanation of this is suggested by Table 27, which shows that the total area devoted to wheat growing in India was rather less in the second period than in the first, and as, on an average, the harvests of the two periods were about equally good the total production declined; at the same time the population of India, which consumes by far the greater amount of the production, increased. Thus the balance available for export decreased, and of the net export from India to all countries the United Kingdom received about half in each of the first two periods. In the third period the total production in India increased greatly, so that both the net export to all countries and also the export to the United Kingdom similarly increased.

The statistics relating to the export from Canada present a different problem, for during the first period the imports to the United Kingdom amounted to 6 million bushels, whereas the net exports from Canada to all countries were only 2 million bushels. During this period the total imports into Canada averaged 5 million bushels and the total exports 7 million bushels, so that the explanation is probably that wheat was imported from the United States into Canada in sufficient amount to enable the latter country to export the 6 million bushels to the United Kingdom. Comparing the three periods one with another, it is seen that there has been an increase in the amount obtained from Canada which has been most marked in recent years; this increase is due to a corresponding increase in the total production of Canada (given below in Table XXXIII.), but in the last period other countries than the United Kingdom have become large purchasers of Canadian wheat.

During the first period the imports from Australia were about equal to those from Canada, but in the second period the Australian harvests were exceptionally poor (owing largely to the widely fluctuating character of the Australian rainfall), so that the production only just kept pace with the growth of the population; the export to all countries was stationary and that to the United Kingdom declined. The better harvests and an increased acreage during the third period have enabled Australia to increase its export very considerably, but in the case of this colony, as in the case of Canada, other countries than the United Kingdom have taken a considerable proportion of the surplus wheat.

The most notable feature of the importation from the United States is the decline in the third period, due to the decrease in the surplus which is now available for export from that country. On the contrary, the importation from Argentina

has steadily and greatly increased so that this country now ranks second to the United States as a source of our wheat supply. Of the remaining countries only Russia sends any considerable supply to the United Kingdom, but in spite of a great increase in the production and the net exports to all countries, Russia's contribution to this country has not markedly increased. In the case of Austria-Hungary it appears that a small amount of wheat still comes from that country to our own, although on the balance it has become an importing country, as shown by the minus sign before the figure showing the net export during the last period.

TABLE V.—Percentages of Total Imports into the United Kingdom from each of the Chief Sources of Supply.

	From the British Empire.				From Foreign Countries.					
Period.	India.	Canada.	Australia.	Total from British Empire.	United States.	Argentina.	Russia.	Roumania.	Austria-Hungary.	Total from all Foreign Countries.
1881–90	12	4	4	20	51	1	15	1	3	80
1891–00	7	7	2	16	56	8	12	1	2	84
1901–10	13	12	7	32	32	16	14	1	0	68

This table shows the proportion of the total imports which has come from each of the chief sources. Attention may be specially drawn to two facts, viz., that the supplies are now drawn more largely from the other parts of the British Empire than was formerly the case, and that the Southern Hemisphere sent 5 per cent., 10 per cent., and 23 per cent. in the three periods respectively. The former fact is important politically; the latter has an economic importance, for as the area of supply is extended to the Southern Hemisphere, the occasional bad harvests in the great wheatfields of the Northern Hemisphere have less influence upon the supply and price of wheat in this country. Moreover, the fact that the supplies from the Southern Hemisphere reach this country during our winter and spring has a further steadying effect upon prices and reduces the need of storage for long periods.

Doubtless, the decrease in the percentage of the supply which comes in the form of flour may be correlated with the decrease of the supply from the United States, whence the greater part of the flour is obtained, and the increase of the supply from Argentina and India, whence the export is almost entirely in the form of grain.

FRANCE.

TABLE VI.

	Area.	Produce.			Net imports.		Consumption.		
Period.	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of milled flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	17·2	17	301	26	39	3	314	8·2	12
1891–00	17·1	18	305	26	36	3	315	8·1	11
1901–10	16·2	20	319	24	10	0	305	7·8	3

A comparison between the figures for the first and second periods shows that in France the conditions at first varied but little, the slight changes being indicative of the more marked ones which became apparent in the last period. By that time the acreage had become considerably reduced, but the yield per acre had increased so much that the total production was greater than before. It is evident, therefore, that the decreased acreage is not alone responsible for the higher average in the yield per acre. If the higher average were due only to the withdrawal of the poorer wheatlands, the total production would have become less in each period since the acreage became less. The fact that the total production increased in spite of the decrease in acreage shows that in France, as in the United Kingdom, improved agricultural methods have brought about a real increase in the productivity of the land.

With the increase in the home production the net imports were reduced, but more than proportionally, so that the total amount consumed became less. As the population increased very slightly, the consumption per head decreased; the amount consumed, however, was large compared with that in other countries, and even now it is greater than that in any other part of Europe except Belgium. Since only 3 per cent. of the total supply is imported France is practically self-supporting as regards wheat, and the little that is obtained from abroad is entirely in the form of grain.

GERMAN EMPIRE.*

TABLE VII.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of milled flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	4·7	19	93	12	18	0	99	2·1	18
1891–00	4·9	25	123	12	41	0	152	2·9	27
1901–10	4·6	29	133	11	70	0	192	3·1	36

The conditions and developments in the German Empire are in strong contrast with those in France. Although the total area of Germany is the greater, the amount devoted to wheat is little more than one-quarter that in France. This area has changed but little during the period, but the production has increased about 50 per cent., the average yield having been raised from 19 to 29 bushels per acre. This must indicate an advance in agricultural methods quite unparalleled in any other country. The imports have also increased, and the percentage of the supplies imported has risen from 18 per cent. to 36 per cent. This steady march of Germany into the world's wheat market is due to two factors: one is the increase in the population—particularly in the valley of the Rhine, by which the imported grain chiefly enters the country—and the other is the greater demand for wheat instead of rye as a food. This change in diet seems to have been the chief factor in the earlier years when the consumption per head rose from 2·1 to 2·9 bushels, while the increase in the population was the more important factor in the later

* This table, corrected as a result of the discussion on the paper, is reprinted at the end of the discussion.

years. As there is every probability that on the one hand the population will continue to increase and to demand a greater amount of wheaten bread per head, while on the other hand there is no indication of a larger area being given to wheat cultivation, and the increase in the yield per acre can scarcely be expected to continue at the same rate as it has done in the past, the demand is likely still further to outrun the home production, and Germany will have to become still more dependent upon foreign supplies.

AUSTRIA-HUNGARY.

TABLE VIII.—Production and Acreage in each portion of the Monarchy.

Period.	Area. Million acres.		Yield. Bushels per acre.		Produce. Million bushels.	
	Austria.	Hungary.	Austria.	Hungary.	Austria.	Hungary.
1881–90	2·7	6·8	16	17	43	118
1891–00	2·7	8·2	16	17	43	143
1901–10	2·8	9·1	19	18	53	160

The statistics of acreage and production are collected independently in Austria and in Hungary, but those of trade apply to the whole Monarchy. The above table distinguishing between the two portions is therefore given first. It will be observed that in Hungary wheat cultivation is of considerably greater importance than in Austria, where the hardier grains rye and oats predominate. In Northern and Central Europe a journey from west to east from France to Russia would reveal an almost uniform decrease in the importance of wheat and barley and a corresponding increase in the importance of rye and oats. In Russia it is in the south-eastern steppes where the wheat production is greatest, and the plains of Hungary may be regarded as an extension of these steppes.

In Austria the acreage has changed but very slightly during the period, but as there was a considerably greater yield in the twentieth century the total production increased proportionately. In Hungary the acreage has distinctly increased; this would presumably be brought about by the utilization of land which was rather poorer than that hitherto given to wheat growing, so that the arithmetical average of the yield per acre might be expected to fall to some extent. On the contrary, it has slightly risen, so that here, as in all other countries hitherto considered, the land has been made more productive. Consequently the total production has become markedly greater.

TABLE IX.—Austria-Hungary as a whole.

Period.	Area.	Produce.			Net exports or imports. (Ex.) or (Im.).			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of supplies exported or imported.	Percentage of flour in net trade.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	9·5	17	161	14	Ex. 11	Ex. 7	Ex. 45	136	3·5
1891–00	10·9	17	186	16	Ex. 1	Ex. 0	Ex. 100	169	3·9
1901–10	11·9	18	213	18	Im. 3	Im. 1	Im. 0	198	4·2

Taking the Monarchy as a whole, there has been an increase in acreage, yield and production, yet not a sufficient increase to meet the demands of a population which has grown in numbers at a practically uniform rate, and has also come to use a larger proportion of wheaten bread, for the amount consumed per head has risen from 3·5 to 4·2 bushels per annum. To meet these home needs the net export at first declined from 11 million to 1 million, and was then converted into a net import of 3 million bushels. In the first period there was an export of grain and also of flour; in the second period the export of grain from some parts of the Monarchy was just balanced by the import of grain to other parts so that the net export consisted entirely of flour; in the last period the export of flour has actually increased, but it has been more than balanced by an import of grain. It must be stated that the original returns do not distinguish between flour made from the different cereals; an estimate that of all flour 70 per cent. is from wheat has been adopted, but it may introduce a small error into the results.

The writer has not been able to obtain figures showing the movement of wheat within the Monarchy for the whole period, but the average amount sent from Hungary into Austria during the period 1901–1910 was 40 million bushels, of which 24 million bushels were of flour. This was in addition to the 3 million bushels obtained from abroad.

A comparison between the conditions in Austria and those in Hungary is shown in the following table:—

TABLE X.—A comparison between Austria and Hungary, 1901–10.

	Area.	Produce.			Net export or Net import. (Ex.) or (Im.)			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of supplies imported or exported	Percentage of flour in net trade.	Total (as food).	Per head.
	Million bushels.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
Austria	2·8	19	53	4	Im. 43	Im. 47	56	92	3·3
Hungary	9·1	18	160	14	Ex. 40	Ex. 25	60	106	5·3

The greater importance of wheat in Hungary, in regard both to production and to consumption, comes out clearly from this table. Austria is dependent upon Hungary for a very large proportion of its supplies, and the Dual Monarchy as a whole is now to be ranked among the importing countries.

RUSSIAN EMPIRE.

TABLE XI.—Production and Acreage in European and Asiatic Russia.

Period.	Area.		Yield.		Produce.	
	Million acres.		Bushels per acre.		Million bushels.	
	Europe.	Asia.	Europe.	Asia.	Europe.	Asia.
1881–90	*30·2*	*(8·4)*	*8*	*(9)*	*244*	*(74)*
1891–00	36·2	*10·6*	8	*9*	300	*100*
1901–10	47·4	14·3	10	11	461	155

The original statistics distinguish between the European and Asiatic portions of the Russian Empire in regard to area and production, but not in regard to trade. The European portion has by far the larger area under wheat, but they are alike in the rapid rate of increase. Bearing in mind the fact that the Asiatic portion is very little developed and has vast areas capable of wheat cultivation, it appears likely that although the rate of increase in the European portion must before long slacken, yet that in the Asiatic portion may be maintained for a considerable number of years, so that the wheat land in the eastern portion may equal that in the western portion. The original statistics are not complete enough to enable the yield per acre in past periods to be accurately compared with those of the present time, but it is quite clear that both in Asiatic and also in European Russia there has been a decided increase in the yield per acre during the last part of the period. As this has taken place together with a great increase in acreage, it must indicate a real improvement in methods of cultivation. Yet there is room for still further improvement, for even the present yields are very low compared with those of most countries. The common lack of education and the conservatism of the people are among the chief causes of this, and with them must be placed the systems of communal ownership or working which usually tend to render change still more difficult and in other ways reduce the efficiency of the cultivation. However, the change indicated by the later figures is likely to continue, for scientific methods of farming are already penetrating the region, and their adoption is more possible now that the communal system is being broken up.

TABLE XII.—Russian Empire as a Whole.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	*(38·6)*	*(8·2)*	*(318)*	66	87	*(27)*	2	*(165)*	*(1·5)*
1891–00	*46·8*	*8·5*	*400*	79	104	*26*	3	*217*	*1·7*
1901–10	61·7	10	616	105	142	23	3	369	2·4

The total production of the Russian Empire is second only to that of the United States, and if the present rate of increase is maintained it will occupy the first place during the next decade. It is great enough to allow nearly one-quarter of the total to be exported, but this proportion is gradually getting smaller, for the population is increasing and also is using a larger proportion of wheat per head. Although not indicated by the above statistics, it may be stated that much Siberian wheat is now exported to European Russia and there consumed, allowing a part of the harvest of the latter to be sent to Central and Western Europe. There has been as yet practically no export of wheat directly from Siberia to other countries.

NORWAY.

TABLE XIII.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	0·01	*25*	*0·3*	—	1·0	75	*1·3*	*0·7*	*77*
1891–00	0·01	*25*	*0·3*	—	2·2	86	*2·5*	*1·2*	*88*
1901–10	0·01	25	0·3	—	3·0	80	3·3	1·4	91

It is only necessary to point out that the quantity of wheat produced is extremely small, that the consumption although increasing is still very small, and that nearly all of what is consumed is imported, mostly in the form of flour.

SWEDEN.

TABLE XIV.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	*(0·2)*	*(22)*	4	—	3	50	7	1·5	43
1891–00	0·2	24	5	—	5	15	10	2·0	50
1901–10	0·2	27	6	—	8	5	14	2·6	57

Little wheat is grown in Sweden, though the amount is increasing and is more than in Norway. Here again the population is demanding more wheat, so that the import is also increasing and now exceeds the home production. It may be noted that the import has become almost entirely an import of grain, and that the milling industry, though still small in absolute amount, has increased during the period from dealing with about 5 million to dealing with about 14 million bushels of grain.

SPAIN.

TABLE XV.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	*(9·0)*	*(11)*	*(100)*	*(13)*	5	0	*(92)*	*(5·3)*	*(5)*
1891–00	*(9·1)*	*(10)*	*(92)*	*(13)*	6	0	*(85)*	*(4·7)*	*(7)*
1901–10	9·2	13	123	13	9	4	119	6·2	8

Before 1900 there were practically no statistics of acreage, and although estimates of production were regularly issued, they had little authority. Therefore, except as regards the imports which have certainly increased slightly, the earlier figures can be taken only to indicate that there have been no great developments. It appears, however, that the country is practically self-supporting in regard to its supply of wheat.

PORTUGAL.

TABLE XVI.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	(0·7)	(10)	7	1	4	0	10	2·0	40
1891–00	(0·7)	(10)	7	1	4	0	10	2·0	40
1901–10	(0·8)	(10)	8	1	3	0	10	2·0	30

In the case of Portugal there are very few returns of acreage, and annual estimates only of production. No great developments can be stated, and the figures merely show that wheat is not largely used. The import both of grain and flour is prohibited, except in time of scarcity.

(*To be continued.*)

REVIEWS.

ASIA.

BRITISH MALAYA.

'The Malay Peninsula.' By Arnold Wright and T. H. Reid. London: T. Fisher Unwin. 1912.

THIS excellent and attractively written record of the development of British rule in the Malay peninsula is in part historical, in part descriptive. The former, which is much the more considerable portion, constitutes at once an emphatic justification of (and a no less emphatic warning to) our imperial builders and thinkers. If we have, on the one hand, a somewhat painful story of ignorance and vacillation on the part of the Home Government, we have, to compensate us, the brilliant inspiration of Raffles' genius, and the calm courage and far-sighted statesmanship of the noble-minded Francis Light, with the heroic self-devotion of a score of others, of whom some sleep to-day in unknown graves. This historical portion of the work calls up to the mind a wonderful gallery of pictures of high romantic and imperial interest, diversified by the varying fortunes of the great triangular dual then proceeding between England, France, and Holland. First comes the selection by an "accident" of Bencoolen as a site for the earliest British settlement in these waters, and the terrible early vicissitudes of its little British colony; the beleaguerment of Light in Junkceylon by "one or two thousand

Siamese," and his rescue from imminent massacre by Monckton; his subsequent settlement of Prince of Wales' island (the foundation of all real British influence in the peninsula), and the appearance on the scene of the Duke of Wellington (then plain "Colonel Wellesley") as the saviour of Penang at the very moment when its abandonment had been decided upon. Next follows the early appearance of Raffles (then a Penang official), as the saviour of Malacca, under similar circumstances; with the amazing diversion of the conquest of Java, and its still more amazing and lamentable retrocession. Next we have the foundation of Singapore and the wrath of the Home Government kindled thereby; the overthrow of piracy by Sir Andrew Clarke and his courageous successors; and, later, the marvellous development of the residental system under such lion-hearted pioneers as Sir Hugh Low, in Perak (and we should add Sir William Maxwell in Selangor), with others of hardly less merit among the dead, and Sir Frank Swettenham and Sir Hugh Clifford among the living. Finally, we see the extension of British influence to the area of the great Non-Federated States of Trengganu, Kedah, and Kelantan, a development which promises to be the opening of a more important chapter than any yet reached. Only the authors' approval of a recent "forward" policy in the Straits, involving infringement of treaty obligations with the native states, is a grave matter, requiring instant challenge. This portion of the book is full of historical and romantic interest; in a high degree informing and suggestive. Old records, notably, in regard to Captain Light, even those of the neighbouring Dutch island of Sumatra, have been ransacked, and no pains spared to give the book permanency as a work of reference.

The descriptive part of the book deals with such subjects as the elements of the native population, means of communication. shipping and commerce, mining and planting, and the administration generally. This part of the book, for the very satisfactory reason that the extraordinary progress now being made is bound somewhat rapidly to alter existing conditions, will, of course, eventually grow out of date, but for some years to come it will stand as a sound, capable, and useful description of the administrative and industrial sides of the life of the peninsula, whilst the value of the historical part will be permanent.

The book contains a few misprints, mostly harmless, though from this category we must except "Buddha Raja" (p. 173), an unfortunate error for "Budak Raja," *i.e.* a member of the "Raja's Youths" or bodyguard. It also has a good map and an excellent index, and we can very cordially recommend it to readers at home who are interested either in geographical matters or in the history of their country, as well as to those who are in any way specially connected with the Malayan region.

W. W. Skeat.

Russian Central Asia.

'The Duab of Turkestan. A Physiographic Sketch and Account of some Travels.' By W. Rickmer Rickmers. *With 207 Maps, Diagrams, and other Illustrations.* Cambridge: The University Press. 1913. 30*s*.

The author applies this title to the country comprised between the Oxus and Jaxartes, and in his hands it proves itself a useful geographical label. Practically every feature of Central Asian physiography is found within this region, though it must be remembered that it represents a transition only, especially as regards desiccation, in comparison with eastern Central Asia, the Aralo-Caspian lakes and rivers of Russian Turkestan being represented by the swamps of Lop and the Tsaidam in Chinese Turkestan and Tibet.

The book is a treatise on physical geography, based on the author's observations during journeys spread over nearly twenty years, and in consequence a perspective is gained which is often lost by the modern rush into print. Indeed, it is in many ways reminiscent of the older books of travel, especially in the author's catholicity of interest. It will not please everybody, for as a scientific treatise its style is distinctly unconventional, and the author's humour is irrepressible. But happily the time has passed when to be scientific was necessarily to be dull. There is the true breath of the East in the descriptions of Samarkand and the life of the various races inhabiting both the "desert and the sown." Even the subject of loess moves the author to a romantic picturesqueness of style. He is fond of contrasts and comparisons. The snows of Peter the Great range suggest reference to and comparison with north Siberian conditions across the intervening steppe. From the deserts of the Kizil Kum to the Pamirs is a far cry, but the author traces a direct connection. A pamir is only "a wide valley with grass steppe above the timber-line of an alpine district." "Of the Duab we may say that the mountains fertilize the desert plains, and that the desert climbs the mountains, creeping into the highest valleys." Pamirski Post at 10,000 feet is actually drier than Petro-Alexandrovsk at 300 feet. Again, "where there are Kirghiz there is steppe; where there are Kara Kirghiz there is pamir."

The author's frequent generalizations, while perhaps open to criticism, are distinctly serviceable to the general reader. "A real meadow only pays in moist climates, and on the valuable irrigated land one must grow plants giving the highest possible quantity per acre." The agricultural aspect of the country is thus made plain at once, and we are not surprised to learn that most of the alfalfa seed used in South America should come from Russian Turkestan. "Dryness loves contrasts," and some beautiful plates expound this fundamental characteristic. Sand is "not so much a deposit blown there as a deposit left there."

Mr. Rickmers is an experienced mountaineer, equally at home in the Alps, the Caucasus, and Turkestan; therefore glacial phenomena naturally claim his strongest interest. The notes and plans on the Tupchek moraines bear witness to close observation. With regard to glacial erosion, he gives the impression of making no effort to strain his facts to fit any preconceived theory, but keeps an open mind. Cautiously, he admits that ice works with less waste than weathering and water. "A covering of snow has a preservative effect." "Glacial protection" he uses in the relative sense, implying lesser destruction. But much depends on local conditions; thus the Sarikaudal glacier during periods of excessive growth has built itself a raised channel above the level of its surroundings. In this instance the author attaches special importance to rapid forward movement, which must reduce the natural tendency to outward splay. (A similar example is shown in the *Geographical Journal*, vol. 35, opp. p. 642.) On the Zarafshan glacier a thickness of only 150 feet was noted for several miles up from the snout, and the deep-reaching dissection of this part is attributed to reduced flow and not only to increased melting, the conclusion being that the lower section is practically stationary and dead—a conclusion similar to, though quite independent of, de Filippi's in reference to the Baltoro. But it is not only in regard to glacial phenomena that the correspondence with Himalayan conditions strikes us. Mud-spates are frequent, the author confirming and amplifying in several details Conway's classical description, and making a suggestive comparison with glaciers. The plates illustrating the upper Zarafshan valley (*e.g.* 80, 85, 95, etc.) might have been taken from the upper Indus or

some of its main affluents, while the beautiful photograph of fluted boulder clay shown on Plate 121 might have come from Chorbat or Nubra.

The appendix is of especial interest, and alone would be a very welcome addition to geographical literature. An excellent general review is followed by sections on Climate, Glaciation, Desiccation, Sand and Loess, with Glossaries, Bibliography, and an ample subject index, in addition to the general index. With regard to desiccation, a much-needed warning is sounded. Climate is ruled by the geographical environment; but because all forms of life are almost wholly subject to climate, we are tempted to think of climate as a first cause. But "topography goes before climate." In the author's view, the present desiccation of Central Asia is due to a post-Aralo-Caspian recontinentalization of climate, and a post-glacial swelling of the rivers is capable of accounting for the establishment of settlements and even cities, now returned to the devouring sands.

Much of the author's work in the mountains has been strictly exploratory, but his modesty almost conceals this. His views on geographical nomenclature are excellent, and he has something to say on the futility of name-scattering, and the crime of altering those already to be found on maps. Geographical labels are necessary, especially in mountain regions, for the European surveyor. The native does not need them, or uses half a dozen different ones, and misplaced reliance on local information has produced quite a large crop of unpremeditated jokes on the map of Asia.

Mr. Rickmers is to be congratulated on producing a remarkable text-book of physiography. It will also serve to introduce a little-known and most interesting region to the notice of the general reader, whose interest in geography appears to be rapidly increasing.

AFRICA.

British Somaliland.

'British Somaliland.' By Ralph E. Drake-Brockman, M.R.C.S. ENG., etc. London: Hurst & Blackett, Ltd. 1912. *Illustrations and Maps.* 12*s.* 6*d. net.*

This book, by the medical officer of the Somaliland Protectorate, is mainly an account of the Somali people, and is the result of ten years' acquaintance with that race. The flora and fauna and the economic resources of the country are also considered. Of equal interest are the opening chapters. These contain an historical summary, and give the best description we have of Zeila, Berbera, and the other ports. Indeed, though no systematic topographical survey of the protectorate is attempted by the author, the attentive reader will not close the book without having gained an accurate knowledge of its leading characteristics. The student of historical geography will find several helpful suggestions regarding its ancient inhabitants, civilization, and trade. Though by the Greeks and Romans Somaliland was sometimes called the Regio Cinnamonifera, the author gives reason for believing that cinnamon was never a product of that land, but was brought to its port of Mossyllum by traders from the East. Somaliland, however, has always been a *regio aromatica*, and its frankincense and myrrh are as renowned to-day as they were three thousand years ago. There are other products of considerable commercial value, such as Sanseviera fibre; but the evacuation of the interior put an end to that industry, which had made such a promising beginning. On the development of trade which would follow the building of a railway from Zeila to Abyssinia, Mr. Drake-Brockman is silent.

The Somali themselves are considered at some length. It is a little difficult

to discover to what extent the author thinks the original stock to have been modified by Semitic influences. That the Somali are a distinctly Hamitic race—whatever signification may attach to that term—appears certain. Arab culture has had its effect, but to an essentially nomadic people civilization makes little appeal. Of the Somali character, the author, while admitting obvious defects, speaks in general praise. He certainly helps to a clearer and sounder understanding of a most interesting race—a race capable, perhaps, of playing a part of some importance in the development of East Africa.

There are many very fine photographs and a good sketch-map, but the index is rather rudimentary.

F. R. C.

British East Africa.

'A Colony in the Making; or, Sport and Profit in British East Africa.' By Lord Cranworth. London: Macmillan & Co. 1912. *Map and Illustrations.* 12*s.* 6*d. net.*

Lord Cranworth, one of the most enterprising settlers in British East Africa, devotes most of his book to that part of the protectorate suited to become a permanent home for white people. This highland area forms but a small proportion of the country; if the author's estimate of its extent be correct, the "white man's land" of East Africa is not much more than double the size of Wales. And though he declares the climate to be "ideal to live in," Lord Cranworth also maintains that it is pre-eminently an overseer's country; that is, farm work, he thinks, will always be done by natives, though for skilled European labour there is ample scope. The author, in short, writes throughout for the prospective immigrant, and his book is the best, as well as the latest, account of the protectorate from that point of view. What, however, the reader does not get is a proper topographical description of the country. This detracts from the merits of the book. Probably this is an omission of which the author is ignorant; that we get no history is doubtless a deliberate decision. It would have been useful, however, to have summarized the chief events since the publication of Sir Charles Eliot's great work in 1905. A description, for instance, of the form of government which the author criticizes would not have been amiss. Lord Cranworth has, in fact, written so good a book that one regrets it is not better. Besides detailed descriptions of the protectorate's resources—agricultural, pastoral, sylvan, and mineral—there are accounts of the native tribes (not from the standpoint of the ethnologist, but of the white settler), of the Indian immigrants, and of the Boer settlers. Lord Cranworth thinks that labour for the farms will always be plentiful. It will be supplied by the Kikuyu, who, to counterbalance many unlovely qualities, have intelligence and an aptitude for agriculture. The part of the book devoted to sport is not given up to thrilling adventures, but forms a very practical guide to the game animals and birds. There is also a fascinating chapter on fishing. Lord Cranworth's style will probably please: it may be guessed from his inclusion of "lion bites and whisky" among the principal diseases of the country.

F. R. C.

'Cairo of To-day.' By E. A. Reynolds-Ball. (London: Black. 1912. Pp. viii., 264. *Maps and Illustrations.* 2*s.* 6*d.*) This sixth edition has been carefully brought up to date, particularly the first two chapters which deal with routes to Cairo, and with local communications and other arrangements, in unusually close detail. This guide-book, as such, aims at a more literary character than most.

'Au Cœur de l'Afrique Equatoriale.' By Captain Maurice Martin. (Lille: Lefebvre-Ducrocq. 1912. Pp. viii., 215. *Map and Illustrations.*) This author's travels lay in the area watered by the northern tributaries of the M'Bomu branch of the Ubangi river. He gives a simple, well-told narrative in diary form, copiously illustrated with photographs. His mission was of an official character, designed to acquaint the French authorities of the Ubangi-Shari territory with the political conditions of a district concerning which they admitted "l'ignorance de ce qui se passe dans le voisinage de la frontière Egyptienne." The journey was not devoid of adventure, and appears to have succeeded in its purpose.

'The Prehistoric Period in South Africa.' By J. P. Johnson. (London: Longmans. 1912. Pp. 115. *Map and Illustrations.* 10*s.*) This is a second edition of Mr. Johnson's study of prehistoric remains, in which an appendix has been added for purposes of comparison on the sequence of stone implements in the lower Thames valley, by Mr. A. S. Kennard. New data have also become available from the material in the Cape Town Museum.

'Thinking Black.' By D. Crawford. (London: Morgan & Scott. 1912. Pp. 485, 18. *Map and Illustrations.*) This volume deals with Central African missionary work, of which the writer has had a very long experience. The strongly individual style of the writing compels attention, though it is not always easy to follow. The author has ranged from Benguela to the Victoria falls and the mouth of the Zambezi, but his work has lain mainly in the heart of the continent, about the region of Lake Mweru. On the nomenclature of this lake and that of Bangweulu he has, by the way, an interesting page. There are many dark tales and exciting incidents narrated in this book, and, if it may be said without offence, its interests are wider than those of many volumes which are concerned with the work of Christianity in savage lands.

AMERICA.

South America.

'South America: Observations and Impressions.' By James Bryce. London: MacMillan. 1912. Pp. xxiv., 611. *Maps.* 8*s.* 6*d.*

There is a very large mass of literature in English dealing with various parts or countries of South America, including not only books of travel and historical and scientific works, but also many of which the primary purpose is to discuss economic conditions. As an accompaniment to volumes which fall into any of these classes, but especially the last, the present work appears to fulfil an admirable purpose. It avowedly does not deal with every political division of South America systematically; some of them, indeed, were not touched by the writer during his long journey. But he passed along the western side of the continent from north to south, and also visited Argentina and Brazil, so that he was well equipped to write a kind of general survey of South America, and he has used his opportunities excellently. The book treats of a great diversity of matters: the Panama canal and the remains of the Inca civilization are topics which mark the two extremes of South American history; both, and many lying between them, have their place in these pages. But all is dealt with coherently, and it may not be arrogating too much to the cohesive power of geographical treatment to recognize its effect here, for the author, possessing an eager eye for natural conditions, very clearly recognizes and illustrates their important bearing on human activities. This feature differentiates his book from those in which geographical description reads as though its writing had been merely

a distasteful duty; for this reason geographical students of South America ought to find the work no less useful than it is well written and interesting.

AUSTRALASIA AND PACIFIC ISLANDS.

New Guinea.

'The Land of the New Guinea Pygmies: an Account of the Story of a Pioneer Journey of Exploration into the Heart of New Guinea.' By Captain C. G. Rawling, C.I.E., F.R.G.S., Somerset Light Infantry; author of 'The Great Plateau,' etc. *With 48 Illustrations and a Map.* London: Seeley, Service & Co., Ltd. 1913. *Price 16s. net.*

After a concise but very clear summary of the story of the discovery of New Guinea and of the partition of the great island among three European Powers (British, German, and Dutch), Captain Rawling, from his own point of view, repeats the story—already told by him in outline in the *Journal* (September, 1911), and by Mr. A. R. Wollaston, in the book reviewed last year in the *Journal* (vol. 40, p. 637)—of the expedition despatched in 1909 by the British Ornithologists Union, with the co-operation of the Royal Geographical Society, to the "Snow Mountains" of Dutch New Guinea.

But this book, though partly a repetition, is by no means superfluous. The author, who was in charge of the survey work of the expedition, *i.e.* more particularly of the geographical side of the work, has strung together his field notes so vividly that his book must be of unsurpassed assistance to the naturalists at home who are working out the observations and collections made during the course of the expedition. Moreover, this book must take its place on the library shelves as one of the most important sources from which the facts will be drawn whenever a full and complete account of the natural features of the great island is compiled.

A specially interesting part of Captain Rawling's field notes refers to his immediate intercourse with the very remarkable pygmy race of men which he and his colleagues were the first to discover in New Guinea; and additional distinction and interest is lent to the book by the fact that Captain Rawling has wisely embodied in it—as Chapter XIX.—a preliminary but weighty note, contributed by Dr. H. S. Harrison, as to the "anthropological 'pygmy question' not devoid of importance" which may even now be asked—on a comparison of these field notes on New Guinea pygmies with what is known of similar pygmy races in other parts of the world.

It is said of the New Guinea pygmies—and more or less the same may be said of all pygmy races known in other parts of the world, that "on the whole, the material culture (of their people), even so far as it is at present known, appears to have been very considerably affected by that of other New Guinea people." "They live on good terms with their bigger neighbours . . . and trade with them apparently on equal footing. . . . In some cases, it is known they consider themselves the original owners of the territory they occupy and of the surrounding country, and their claim is admitted—academically at least—by their neighbours. . . . We are justified in the provisional belief that we are dealing with the scattered and reduced remnants of an ancient race . . . whose former wide territory has been invaded and annexed, in some cases many times over."

In summing up the results of the expedition in which he took part, Captain Rawling writes of the production of "a map of 3000 square miles of hitherto unknown land, complete in every detail, from the highest peaks of newly discovered mountains to the sluggish rivers of the plains. Amongst other discoveries of geographical interest must not be forgotten the Snow mountains of

Idenburg, the castellated peaks of Leonard Darwin, and the greatest precipice in the world."

"As I write" (this is a quotation from Captain Rawling) "Wollaston has set forth again with a most perfectly equipped expedition, taking a new and greater river as his line of advance, and there can be little doubt, provided no unforeseen disaster overtakes him, that his ambition to reach Carstensz by this route will this time be realized."

At the moment at which this notice is penned, the writer of it sees in the newspaper a first brief reference to Mr. Wollaston's arrival in England on his return from the further expedition above mentioned. The story of the success of this last expedition may be awaited with some confidence.

E. IM T.

'Pioneers in Australasia.' By Sir Harry Johnston. (London: Blackie. 1913. Pp. xiv., 308. *Maps and Illustrations.* 6s.) This volume of Sir Harry Johnston's "Pioneers" series covers the eastern parts of the Malay Archipelago, Papua, Australia, New Zealand, and many Oceanic islands. Is is particularly appropriate, when the views, often strangely erroneous, of the early navigators on the topography and physical conditions of these lands are recalled, to find a somewhat elaborate discussion of them at the beginning of the volume; it is no less appropriate that the native peoples, in view of the prehistoric "pioneering" work which emigrations apparently represent, should also be made the subject of a chapter.

'The Life of Sir Joseph Banks.' By Edward Smith. (London: Lane. 1911. Pp. xvi., 348. *Illustrations.* 12*s.* 6*d.*) It is needless here to enlarge upon Sir Joseph Banks' services to geography; they appear very clearly in this survey of his life and work, and many interesting details emerge, especially concerning his voyage and relations with James Cook, and of that navigator's own work and personality. It is, again, intensely interesting to read Banks' strong views in favour of the colonization of New South Wales, an idea of which the origin is actually attributed to him. This "life" is one which cannot be overlooked in any consideration of the history of geography at that important period of its development. A word of praise is due to the illustrations, which are well above the average of those which usually accompany biography.

'La Géographie humaine.' By Jean Brunhes. (Paris: Alcan. 1912. Pp. xv., 802. *Maps and Illustrations.* 20 *fr.*) A second edition of M. Brunhes' massive work has been called for with a rapidity which must be gratifying to him. He has taken occasion to make a number of additions, whether explanatory or in modification of statements in the original version. This is especially the case in the chapters which deal with regional, social, and historical geography on general lines (chap viii.), and with the geographical standpoint in regard to economic, social, and historical problems, the "psychological factor," and human adaptation to geographical conditions (chap. x.). Some excisions have been made, particularly in the chapter dealing with geographical teaching, while a large number of new illustrations have been added.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

THE AFRICAN ARC OF MERIDIAN.

'Colonial Survey Committee.' Report of the Measurement of an Arc of Meridian in Uganda. Vol. 1. London: Wyman & Sons. *Price* 2*s.* 6*d.*

This interesting and valuable piece of geodetic work was the outcome of a suggestion made by the Colonial Survey Committee in 1906–1907. At that time

a joint Anglo-Belgian Commission was employed in surveying the region near the 30th meridian between Lake Albert and the parallel of 1° S. The committee saw that this was an opportunity, such as might not recur for years, for utilizing some of the *personnel* of the joint commissions, after the completion of their official work, for measuring a section of the arc along the 30th meridian, and thus helping to realize the great project, first definitely mooted by Sir D. Gill, for carrying a geodetic arc from the Cape to the Arctic. The cost of the work was met partly by a grant from the Treasury and partly by donations from four scientific societies—the Royal Society, the Royal Geographical, the Royal Astronomical, and the British Association. It amounted to £3800. This did not include the astronomical observations, which were done by a Belgian observer, M. Dehalu, nor did it include the greater part of the expense of camp equipment, instruments, and tools.

The work was fully up to the exacting standards set in South Africa for first-order triangulation. The probable error of the base measurement was one part in one million, and the average closure error of a triangle was 0″·8, corresponding to a probable error of an observed angle of 0″·4.

The datum for the altitudes was a gauge on Lake Albert, of which the height is derived from the levelling results along the railway from Mombasa to Port Florence, and thence by water-level to Entebbe, and then again by spirit-levelling to Butiaba. The results are fairly consistent, and the final assumed height of the lake (May to July, 1908) is +2028 feet.

We trust soon to hear that this arc is being extended southward through German territory to meet the termination of the South African section immediately to the south of the southern end of Lake Tanganyika.

E. H. H.

Photographic Surveying.

'Die Geschichtliche Entwicklung der Photogrammetrie und die Begründung ihrer Verwendbarkeit für Mess- und Konstruktionszwecke.' Von Max Weiss. Stuttgart: Strecker & Schröder. 1913. *Illustrations and Diagrams. Price* 12 *marks.*

This is a typically German publication, a sort of *catalogue raisonnée* of all the instruments designed for any form of photographic surveying, with numerous full-page illustrations and a complete bibliography of the books on the subject in all languages. The latter feature is useful, but the main part of the book seems to us of little value.

The possibility of carrying out a survey of a country by photographic methods is admitted. What we want to know is how this method compares with others, and whether, in particular, we in England are right in thinking that photo-surveying is more akin to an amusing game than to a useful art. Much as it has been discussed, and vast as the continental, especially German, literature on the subject is, we have never yet seen an account of any direct test in the form of competitive surveys executed at the same time of the same piece of country, the one by an ordinary surveyor using well-established methods, and the other by a photogrammeter (if we may use the word), followed by a critical comparison of the resulting maps.

Until we see this we shall retain an attitude of scepticism, an attitude which the book before us does nothing to modify.

E. H. H.

Surveying.

'The Effects of Errors in Surveying.' By Henry Briggs, M.Sc., Honours Associate of the Royal School of Mines, etc. London: C. Griffin & Co., Ltd. 1912. *Price* 5*s. net.*

Although specially concerned with mine surveying, the matters here dealt with are by no means confined to that class of work, and, in fact, this book cannot fail to be of importance to all land surveyors who desire to do accurate work, and to learn under what conditions accuracy can best be assured.

The mathematical investigation of errors in surveying, their source, propagation, and effect in triangulation, traversing, and levelling is a subject which has in the past not received quite the attention in this country that it deserves; for while there are quite a large number of continental and American works dealing with the subject, those that have appeared here are comparatively few, for which reason the present publication should be specially welcome. After a brief introduction Mr. Briggs deals in the succeeding chapters with—II., The Analysis of Error; III., The Best Shape of Triangles; IV., The Propagation of Errors in Traversing; V., The Application of the Methods of Determining Average Error of Certain Problems in Traversing; VI., The Propagation of Error in Minor Triangulation; VII., Summary of Results. Then follows an Appendix giving a few useful tables. Much that is given by Mr. Briggs will doubtless be familiar to surveyors, but there is a considerable amount of originality shown in dealing with some of the investigations, and the results of these are given in a summary in Chapter VII., which will be useful for reference. Although the mean square error and the probable error are dealt with, and the familiar probability curve diagram given, it is the average error that is accepted as the criterion of a series of observations, and made the principal basis and subject of investigation throughout the book. The average error is defined as the arithmetic mean of the separate errors, or residuals, taken all with the same sign, either plus or minus. The following three reasons for deciding upon this choice are given by Mr. Briggs: first, that it is the standard of comparison most serviceable in a discussion of the relative accuracy of different results and processes; secondly, that it is more readily determined in practice than either of the other two forms; and thirdly, that it is more easily understood by those not well versed in the mathematical theory of errors. Whatever may be the general opinion as to this, it is certain that the book contains much valuable information that cannot fail to be of service to all engaged in accurate survey-work of any description. Levelling is not specially dealt with, and it might be well in another edition to give some pages to this subject.

Map Projections.

'Leitfaden der Kartenentwurfslehre von Prof. Dr. Karl Zöppritz.' In Dritter neubearbeiteter und erweiterter Auflage, herausgegeben von Dr. Alois Bludau. Erster Teil: Die Projektionslehre. Mit 154 Figuren in Text und Zahlreichen Tabellen. Leipzig und Berlin: B. G. Teubner. 1912. *Price* 10*m.*

In 1883 Prof. Dr. Karl Zöppritz brought out the first edition of his 'Leitfaden der Kartenentwurfslehre,' an excellent work intended to meet the needs of universities and higher educational establishments. The author died two years after, and so it fell to the lot of Dr. Alois Bludau to prepare the second edition for publication. This, which appeared in 1899, owing to the numerous changes and additions, might almost have been considered an entirely new publication. That the work has been fully appreciated is evident from the fact that a third

edition has become necessary, and in the preparation of this Dr. Bludau has taken into consideration the more important map projections that have appeared in recent years, which he has described and illustrated by diagrams. Among these may be noted Van der Grinten's projection, accounts of which are given in *Petermanns Mitteilungen* for July, 1904, and the *Geographical Journal* for December, 1904, Craig's Retroazimuthal projection, described in his book on 'The Theory of Map Projections,' published at Cairo in 1910; and several others. Altogether this new edition of Part I. of the work, which is devoted almost entirely to map projections, contains much new information, and it has been increased from 178 to 264 pages, including several additional tables and a useful index.

Speed Measurement.

'The Speed and Current Chronographer.' By Captain A. G. Noble, F.R.G.S., Extra Master, etc. Liverpool: Charles Birchall, Ltd. 1913.

This is a little pocket-book containing 376 pages of tables, which are divided into two parts. In Part I. each page gives in feet the distance a vessel will run in the time stated at head of the page at every quarter of a knot speed. In Part II. the distances are in miles and decimals of a mile.

These tables are, of course, primarily intended for facilitating accurate navigation, for which they should be of considerable service; but they can also be used by motorists and others for ascertaining speeds on land, in which case the knots can be readily converted into miles by referring to a table at the end of the book.

Captain Noble has furnished precise instructions, and any one wishing to make use of the tables will find little difficulty in doing so.

Meteorology.

'Weather Science.' By R. G. K. Lempfert, M.A. London: T. C. & E. C. Jack. [1912.] Pp. vii. and 94. *Price* 6*d*.

This little volume is one of the numerous presentations of scientific knowledge on a more or less popular basis that have appeared of late. The work shows far more marks of originality than many similar productions, and the author has presented the expert knowledge of an official meteorologist in as clear a manner as the recondite nature of the subject will allow, merely assuming in his readers some acquaintance with the rudiments of physics. There is a chapter indicating the valuable results of recent upper-air researches by means of kites and balloons, and another touching upon the modern method of statistical correlation; but the most interesting and original part of the work is that discussing the convergence of air currents and other factors provoking rainfall in a cyclonic depression. The extremely rainy character of some of our east winds on the northern side of an ordinary eastward-moving depression is shown to be due to the fact that the easterly current, being cold and in itself relatively dry, has the effect of a mountain barrier upon the warmer moisture-laden south-westerly current on the southern side of the barometric minimum, forcing it to ascend and climb, as it were, over the shoulders of the dense surface current. The result of this process is, of course, specially rapid condensation and persistent heavy rain, which thus falls through the dry surface-wind from the east. To say that the easterly wind on such occasions is very wet is, of course, correct, but it is important to remember that the moisture really comes, as usual, from a south-westerly current off the Atlantic. On p. 34 we read the following with much satisfaction: "The picture represented by the isobars is undergoing continual

change. Weather maps have been drawn day by day for the past fifty years, but in all this long time it may safely be said that no two maps have been identical." Herein, no doubt, lies half the enigma of the atmosphere. Similar types of weather conditions are constantly recurring, but identical conditions never repeat themselves over the globe. The atmosphere is subject, not only to a number of external factors like solar radiation, the axial rotation of the Earth, distribution of land and water, etc., operating upon it to produce change and motion (which acting alone might cause identical changes to recur periodically), but also to a set of influences arising from the fact that the movements initially set up by the external factors are themselves a factor in determining precisely what the subsequent changes shall be. The changes of the weather, though *recurrent in type*, are infinitely *variable in detail;* and in saying that the *changes* of the weather are variable, we mean a good deal more than that merely the *weather* is variable.

L. C. W. B.

Oceanography.

'Scientific Papers.' By J. Y. Buchanan, F.R.S. Vol. 1, pp. 12 + 15 papers (separately paged). Cambridge: University Press. 1913. 10*s.* 6*d. net.*

The papers which Mr. Buchanan republishes in this volume are specially interesting as placing on authoritative and permanent record the original papers of a worker who was to a very great extent a pioneer in a new subject. However great are or may be the amplifications and modifications of the results obtained from the great voyage of H.M.S. *Challenger*, it cannot be disputed that they laid the foundations of physical oceanography, and that the foundations were well and truly laid. Upon the chemist and the physicist of the expedition there fell the task not only of exploring unknown seas, but of devising means of doing so; and the most important papers in this volume are probably those discussing the relation of specific gravity to salinity in sea-water, the formation of sea-water ice, and instrumental methods generally, or describing the laboratory experiences on board the *Challenger*, or apparatus employed in deep-sea investigation up to the year 1881.

Mr. Buchanan's work has been discussed and built upon by later workers of all nationalities, and it would serve no good purpose to attempt to add to those discussions here. We may be allowed to offer our congratulations to a veteran in the field of research upon the appearance of this book of collected papers.

GENERAL.

'A Geography of the World.' By B. C. Wallis. (London: Macmillan. 1911. Pp. xvi., 372. *Maps and Illustrations.* 3*s.* 6*d.*) 'A First Book of General Geography.' By the same. (London: Macmillan. 1912. Pp. viii., 151. 1*s.* 6*d.*) In the first of these volumes great stress is laid upon the value of the quantitative expression in geography, on which the author has already insisted in these pages. The statistical tables, introduced freely into the text and dealing not only with economic products, but also with climatic conditions, etc., must to some extent necessarily interfere with the easy reading of the book as a whole, but render it unusually useful for reference, while they possess a more than ordinary value from the point of view of permanence by being based on a careful working out of averages. Many examination questions are quoted. The second and more elementary volume to some extent subordinates general description to the elaboration of particular illustrations, and (apart from an occasional effect of disjointed arrangement of matter) with good results, for the book is pleasant

to read, and free from any forbidding formality in its array of facts. In these books there are good coloured physical maps of the continents—it is not always clear how the practical work indicated in connection with these is to be executed —and in both volumes the standard of map-work and of pictures is excellent.

O. J. R. H.

THE MONTHLY RECORD.

EUROPE.

A New Port for Milan.—We have received particulars of an important project for the construction of a vast port for the city of Milan destined to meet all possible future developments of internal navigation. The municipality has expressed approval of the project, and intends to apply to the State for powers to carry it into execution. Detailed studies have been carried out by MM. Beratta and Maiocchi, who, from wide experience of the most important river-ports of other European countries, have drawn up plans for the proposed port in respect of quays, wharfs, warehouses, railway and other communications, docks, workshops, and installations of all kinds on the most approved modern principles. The total area to be covered by the port is 112 hectares (277 acres) of which about 50 acres will be occupied by the basins, an equal area by roads, railways, etc., 25 acres by the stations, and the remainder by the quays. It is hoped to begin operations at an early date, so that the port may be ready by the completion of the great Venice-Milan waterway, which is to give passage to vessels of up to 600 tons burden.

Hydrological Research in Venetia.—We have received a publication of the 'Magistrato alle Acque,' of Venice, translated into French under the title 'Notices sur le Bureau Hydrographique du "Magistrato alle Acque" et sur quelques-unes principales systémations fluviales en cours dans la Vénétie.' It deals with the nature and economic importance of the work of the various services of the Hydrographic Bureau, such as those connected with rainfall, regulation of watercourses, foreseeing of floods, etc. The majority of the Venetian rivers being formed by tumultuous torrents which descend from mountains nearly destitute of glaciers, traversing regions of considerable precipitation, and not being regulated in their course by natural reservoirs, possess in general an irregular *régime*. As they spring in great measure from the dolomite region of the Alps, and are not filtered by passage through lakes, they carry much detritus, which is deposited where they widen out on issuing from the mountain gorges. Over these enormous alluvial deposits the rivers flow at random, and lose much water in their badly cut-out beds. These absorbed waters issue again below the detritus zone, and there partly enter into the formation of new limpid streams, like the Sile and Lemene, and thus serve to restore water to the rivers impoverished while traversing the sulb-alpine zone. From this zone to the sea the rivers lose their torrential character, and assume the aspect of rivers properly so called. They are confined in their beds and flow through the plain dammed up. Nevertheless, in consequence of the abundance of alluvial matter, the beds of these streams are diminishing annually in depth, especially in the passages where the water is restrained by dykes, so that when in times of flood they overflow and burst through the dykes, widespread havoc and ruin result. It was in order to remedy such hydraulic conditions that the

Italian Government passed an Act on May 5, 1907, sanctioning the constitution of an autonomous Institute, specially designated "Magistrato alle Acque," whose function was to supervise the forest laws, the construction of hydraulic works, and to promote the salubrity of lands, harbours, and shores. The "Magistrato," which is situated in Venice, exercises jurisdiction over about 26,000 square kilometres of territory. The name "Magistrato alle Acque" is one of good augury in so far as it recalls a similar institute of the old Republic of Venice, which left hydraulic works such as are a veritable monument of wisdom and engineering skill. We may judge the former importance of Venetian hydrography from the following decree of the republic: "Hæc materia acquarum est tanti ponderis atque momenti, ut uno verbo dici possit importare secum consistentiam totius status nostri."

ASIA.

Dr. Musil's Latest Journey in Northern Arabia and Mesopotamia.—We have received from Dr. Musil a preliminary narrative of his trip in Northern Arabia and Mesopotamia carried out in the summer of 1912 in company with Prince Sixtus of Parma (*Journal*, vol. **40**, p. 643). It is reprinted from the *Anzeiger* of the Philosophical-Historical Class of the Vienna Academy of Sciences (1913, No. 1). The traveller was provided with the necessary scientific instruments through the good offices of the Military-Geographical Institute at Vienna and other public bodies, and had as scientific coadjutor Sergeant Rudolf Thomasberger, who had given valuable aid on Dr. Musil's former expeditions. Besides a survey of the route, the programme included the collection of material for the topographical description of the whole region, the investigation of all remains of ancient civilization, the making of plans, taking of photographs, copies and squeezes of inscriptions, collection of plants, etc. From Damascus the party proceeded to Homs, and thence to Tadmor by a circuitous route leading south across the Rawak range, at the southern foot of which the ruins of the once flourishing city of Danaba, controlling three important routes, were visited. Here, as on many parts of the route, much havoc had been wrought by diggers for antiquities, who appear to have plied their trade with unwonted activity during the past few years. From Tadmor, where a survey of the ruins was made, the route led across a limestone range, covered in parts with groves of terebinths and oaks, by the old watch-tower of At Turkmanije, to the Euphrates a little above Rakka. On the way thousands of dead animals were seen, victims of the heavy snowfall in February.* Many ruins were observed, and many small villages were passed, whose inhabitants were working night and day to irrigate their cornfields. At Rumadi the travellers left the Euphrates and went south by the old city of Ain at Tamr (covering a space of 3 kilometres by 2) and other ruins to Nejef, and Kufa on the west branch of the Euphrates; thence making their way to Baghdad after visiting Kerbela and the German excavations at Babylon. Many ancient and modern canals were crossed in this section. The return route from Baghdad led first to Tekrit on the Tigris by way of the old Median wall and Samarra, and then across southern Mesopotamia to Rawa (the point where Miss Bell left the east bank of the Euphrates in 1909). Hence to Rakka the travellers kept generally parallel to the river, but at some distance to the east. A peculiar feature observed between Tekrit and Rawa was a great number of

* Baron von Oppenheim, in his journey to Mesopotamia in 1911, found that many animals had been lost from a similar cause in the preceding winter (*Journal*, vol. **39**, p. 155).

mounds formed of a crust of alabaster sometimes a metre in thickness. They are hollow, and some will shelter as many as twenty persons. In this part of the route the well-water was undrinkable from the swarms of dead locusts. Towards the Euphrates the country on this side falls in a series of broad terraces occupying a width of some 20 miles. Karable island, opposite Rawa, is the most northerly site of palm-groves on the Euphrates, the limit of palms here reaching further north than on the Tigris, which is less sheltered from northerly winds. Between Rawa and the Khabur the route passed the salt swamp of Al Edejd, and the well-water, though clear, was brackish. The guide declared that there had been no beneficial rain for six years, and the whole surface was bare, yielding no fodder for the camels. After crossing and finally leaving the Euphrates, the party was attacked and plundered by marauders, and with difficulty made their way to Aleppo in almost complete destitution. The scientific material was, however, fortunately saved. Dr. Musil claims to have secured material for a map of the whole country traversed, besides collecting valuable information on parts not actually seen.

Geography and Peoples of Luzon.—In an article on the geology of Luzon, contributed to the first number of the *Journal of Geology* for the present year, Dr. Warren D. Smith supplies a useful sketch of the general physical features of the island and their influence on the character and pursuits of the inhabitants. The dominant feature, he points out, is the enormous coast-line and the mountainous character of much of the interior. Having much high-level country, which is at the same time fertile, Luzon offers a field for colonization by white men. The coastal plains are, as a rule, very narrow, and are almost lacking on the east coast (which the drowned river areas show to be sinking in part), so that here settlements are extremely scarce. The principal interior plain is that known as the Great Central plain, stretching from Manila bay to Lingayen gulf, and constituting the chief place of settlement in the whole group. It was probably the site of an ancient arm of the sea. Next in importance is the Albay plain in the south-east, the volcanic soil of which makes it the principal hemp region of the Philippines. The "intermediate" uplands are formed chiefly of folded Tertiary sediments, with the coal-measures and the lower volcanic stocks. The population here consists largely of the less progressive types of natives, and of more or less recent white settlers. Of the higher ranges, the remarkably sinuous eastern Cordillera is still little known, and is but sparsely inhabited by Negritos, Tagalogs, etc. Yet it is traversed by several well-defined passes, which have been important for the settlement of certain parts of the east coast. The Central Cordillera extends in two or three parallel ranges from the central knot (where it branches from the Eastern Cordillera) to the extreme north. The formations are largely igneous, and the population consists almost entirely of Igorots and related tribes. The country is almost entirely without roads, and the numerous Igorot trails take no advantage whatever of the topography. Government is, however, constructing a horse trail, to be eventually made into a motor road, which follows the backbone of the Cordillera. The Western Cordillera, or Zambales range, is not by any means continuous. In general, the rocks are volcanic extrusives, with marls and shales on the flanks. The inhabitants are mainly Negritos. Lastly, in the south-east there has been built up, on what was once a more or less level plain, a cluster of volcanic cones partly dissected by erosion, though including the still perfect cone of Mount Mayon. This district is one of the finest in the group, both from a scenic point of view and agriculturally. As regards the inhabitants of Luzon, certain tribes are seen to dominate certain

regions. In the Central Cordillera we have the Igorots, a stay-at-home people hitherto isolated within their mountain barriers. The northern coastal plain is occupied by the Ilocanos, a rapidly increasing tribe, probably the most virile in the Philippines, which is already wedging its way into the Igorot territory. Being a great rice-grower, the Ilocano will probably dominate all the lowlands. The Tagalogs of the Central plain are the most advanced in Western civilization, but this is probably due merely to the fact that they happened to dwell in the locality formed by nature for the chief foreign settlement. Physically not much can be said for them, and they are being crowded back towards Manila by other tribes. The Negrito has been pushed back into the unknown and inaccessible mountains and forests, and is evidently a vanishing tribe. The Bicol agriculturist of the south-eastern peninsula is a hard-working and peace-loving individual, but is not likely to increase his present range. Lastly, the Cagayan is peculiarly restricted to a well-defined natural habitat, being confined to the Cagayan valley and the Batanes and Babyanes islands to the north. With the advance of civilization the present tribal characteristics will, no doubt, tend to disappear.

AFRICA.

The Population of Morocco.—The exaggerated estimates which once placed the total population of Morocco at anything from ten to thirty millions were brought down to a figure nearer the truth by the careful study of Captain Larras in 1906 (cf. *Journal*, vol. **28**, p. 78), which placed the total at from four to five millions. More detailed investigations since the French occupation, discussed by M. de Caix in *L'Afrique Française* for May, 1913, have shown reason for the belief that even these figures are too high. A census of the Shawia territory has given a total for this comparatively fertile and well-peopled area of 205,000, or only 18 to the square kilometre. Such a density applied to the whole of Morocco, fertile and desert alike, would give a total of only 3,600,000. On the other hand, a careful estimate of the population of all the occupied districts and regions bordering on them places the total of these at only some 2,300,000, and the reports of travellers regarding the outlying regions give no reason for adding, for these, more than would bring the grand total to 3,000,000. These conclusions are supported by a comparison with Algeria at the time of the French occupation, allowing for a certain excess of fertile and well-peopled territory in the case of Morocco.

Dwarfs in the Kamerun.—Prof. Thorbecke, whose new expedition into the Kamerun interior was referred to in vol. **41**, p. 167, has made the interesting discovery of a hitherto unsuspected race of dwarfs among the mountains bordering on the great Wute plain in the angle between the Sanaga and its tributary the Mbam (*Deutsche Kolonialzeitung*, March 15, 1913). A triangular massif rises from the plain to a height of 1300 feet overtopped by steep rocky peaks. In the small caves in the granite of the highest of these, Yanjom by name, the dwarfs found a refuge until within recent years, when they were discovered and brought down as captives by their Negro neighbours. It was only when planning an ascent of the peak that the traveller became aware of their existence, through being recommended to use them as guides. Fourteen individuals were seen and photographed (several photographs are reproduced with the traveller's communication, *loc. cit.*). They were by no means ugly or repulsive, and from a little distance made no remarkable impression unless seen side by side with their taller neighbours. Closer inspection showed them to be marked by a round head, relatively large trunk, long arms, small and weak legs, and small

hands and feet. The height of the men varied between 140·3 and 150 cms. (4 feet 7 inches and 4 feet 11 inches). They formerly lived by hunting and on roots and fruits, but have been taught agriculture by their captors. No remains of an original language could be made out, but the Negroes asserted that they used such in mourning for the dead. Efforts to procure a skull were unavailing, the dwarfs declaring that they threw their dead into an inaccessible ravine. Whether any survive in a state of freedom could not be ascertained.

Fluctuations of the Level of Lake Tanganyika.—News from two different stations on Lake Tanganyika record a renewed rise in the level of the lake after a general sinking of level extending over a number of years (*Mitt. Deutschen Schutzgebieten*, 1913, No. 1). From Usumbura in the north it is reported that a post placed at the water's edge by Lieut. Fonck shortly after 1900 now stands in the water 20 metres (66 feet) from the shoreline, in a depth of 78 cms. (2 feet 6 inches). The missionaries at Karema likewise state that after falling some 7 metres (23 feet) since 1879, the level has for the last four years risen about ¼ metre (9·8 inches) yearly. At Usumbura there are shore terraces 7 to 10 metres (23 to 33 feet) above the present level, and the oldest inhabitants are said to remember the time when they were lapped by the water. From these facts it is concluded by the Meteorological Office at Dar-es-Salaam that the highest possible level lies 10 metres (33 feet) above, the lowest 1 metre (3¼ feet) below, the present. In commenting on this Dr. Marquardsen, geographer to the German Kolonialamt, endeavours to lay down the period of the whole fluctuation,and thinks that the highest known level occurred in 1878, shortly after Stanley's visit (when the Lukuga outlet was blocked), while the close of the period of fall is to be placed in 1908, giving a period of thirty years. It can hardly be maintained, however, that the fall has continued so constantly and regularly throughout the period as this would imply. A comparison of all the evidence which has accumulated since the discovery of the Lukuga shows that, while there has been a general downward tendency throughout the period, this has been checked for several years at a time or even reversed, as was apparently the case about 1901. The lake was then stated (*Journal*, vol. 19, p. 601) to be 4 to 5 feet higher than in the corresponding month of 1900, owing to the silting up of the Lukuga outlet. The present rise, it would seem, may be likewise due to such a temporary blocking of the outlet,* and it is hardly to be concluded that a prolonged period of rise has now set in, especially as the missionaries report a deficiency of rain during the past two years, and a cessation of the rise for the time being. References to previous discussions of the subject will be found in the General Index to the first twenty volumes of the *Journal*, *s.v.* Tanganyika, Level.

AMERICA.

Ascent of Mount McKinley.—It will be remembered that a persevering attempt to reach the summit of Mount McKinley was made in 1910 by Prof. H. C. Parker and Mr. Belmore Browne (*Journal*, vol. 38, p. 434), but that the climbers were baffled by impassable walls of ice and were forced to desist. They then planned to renew the attempt in winter when the country between the coast and the mountain could be traversed on the snow with dogs and sledges, and to adopt a different route for the final climb. This plan was

* Mr. Schmitz, however, in a recent work quoted in the *Mouvement Géographique* for May 11, expresses the opinion that the bar broken through about 1880 has shown no tendency to re-form.

carried out in 1912, and on that occasion they were successful in reaching the summit ridge of the mountain, though forced by bad weather to retrace their steps without standing on the hummock which represents the actual culmination. The story of the climb is told in brief by Prof. Parker in the *Alpine Journal* for May, 1913. Setting out early in February, they ascended the Susitna river and its branch the Chulitna, and crossed to the northern side of the Alaska range by two new glacier passes, 6300 and 5000 feet in altitude. This brought them to the Muldrow glacier, north-east of Mount McKinley, but here the comparative scarcity of snow owing to the smaller precipitation and severe winds made progress difficult, and it was only on April 24 that the base camp, 10 miles from the mountain at an altitude of 2500 feet, was reached. The first attack was begun on April 29, by way of the McKinley glacier, which sweeps up to 11,000 feet between the north-east and north ridges of the great mountain. After making a first depôt at 10,500 feet the travellers were delayed some weeks by bad weather, and on renewing the attempt early in June were compelled by the newly fallen snow to use snow-shoes up to nearly 12,000 feet. By concealing the crevasses the snow made it necessary to proceed with great caution. Reaching the head of the glacier beneath the great cliffs of Mount McKinley, they ascended the north-east ridge, forming a climbing base at 11,800 feet. By five days' arduous work supplies were relayed up the ridge to a camp at 15,000 feet, just below the great basin between Mount McKinley's two peaks. The travellers were now unable to digest the pemmican which formed the bulk of their food supplies, and were forced to abandon its use. Their vitality became considerably impaired by the lack of nourishing food, and they found their power of resisting the cold greatly reduced. On June 29 they started for the summit, cutting steps up the steep side of the north-east ridge. At the foot of the final summit snow began to fall and every landmark became obliterated. After nearly 2 hours of desperate climbing in the storm, above 19,500 feet, they came out on the crest of the ridge and met the full force of the gale. Their condition was now such that it was out of the question to go on, it being impossible to find the way in the clouds of blizzard-driven snow. After a renewed attempt on July 1, the state of the food supplies necessitated commencing the descent with all possible speed.

Climatic Changes recorded in New York City.—In the *Bulletin* of the American Geographical Society for February, 1913, Mr. Henryk Arctowski discusses the monthly and annual records of pressure, temperature, and sunshine in the city of New York, as taken from the middle of the nineteenth century to the present time, in regard to their bearing upon the question of climatic variation. The sunshine figures show a steady decrease in the yearly numbers of hours of sunshine from 1877 till 1890, followed by a more or less progressive increase, the general progression being broken either way by characteristic ups and downs from year to year. The curve of temperature variation is similar to that of sunshine, though inverted, smaller durations of sunshine corresponding to higher values of temperature—an unexpected relationship (not shown by the author for Pavlovsk in Russia), and obviously the effect of opposing factors. The curves of pressure and temperature follow the same variation to a striking extent, at all events between 1889 and 1897. If one studies the depressions and crests on these curves of variation, it is found that the interval of time between the depressions averages twenty-five months in all three cases, indicating that the oscillations are the expression of a common underlying cause. The waves, however, are very irregular both in amplitude and in the length of time they individually cover, so as to be of little

practical importance in forecasting the variations of any particular season. Mr. Arctowski has introduced the suggestive terms "pleion" and "anti-pleion" to denote the crests and depressions of the curves, and it is rather remarkable that the yearly variation of temperature and other elements, which is so irregular, and the product of the coadjustment of so many variable factors, should show on preliminary analysis any systematic peculiarities at all. A further analysis would require the study of daily records showing the entire succession of temperature waves. There is some similarity between the different sorts of waves of the sea—ripples, groups of waves, swell, tidal waves, etc.—and the oscillations of temperature. The present writer has for some time suspected that the unknown laws which govern the recurrence of weather types may be locked up in some such complex mathematical series as Fourier's, and potentially capable of being expressed by a number of harmonic curves. It is, of course, quite impossible to put the matter to the test owing to the fact that scientific meteorological records are only available for a short period back; but if at some future time the records of several centuries over a large portion of the Earth's surface come to be analyzed mathematically, and a clue obtained as to whereabouts on the curve of variation of one or more meteorological elements the passing moment lay, the problem of predicting the general character of the weather for a long time ahead would be partly or wholly solved.

Cold Surface Water on the West Coast of North America.—A discussion of the cold-water belt along the western United States in the light of Ekman's theory of oceanic circulation was put forward last year by Mr. G. F. McEwen in the *Internationale Revue der . . . Hydrographie* (vol. 5, parts 2 and 3). The cause of this remarkable belt of cold water has been long a matter of controversy, its occurrence being at first put down to a surface current bringing water from higher latitudes. It was held by Mr. J. Y. Buchanan (*e.g.* in his suggestive paper on "Similarities in the Physical Geography of Great Oceans," published in the *R.G.S. Proceedings* for December, 1886) that the cold water must rather be ascribed, like that occurring on other similarly situated coasts, to the upwelling of cold bottom water from the ocean depths. Mr. McEwen appears to know Mr. Buchanan's paper only at second hand, from a paper by Holway in the University of California Publications for 1905, from which he also takes over a misspelling of the name of the German geographer Andree as Andrees. Thus in the sole reference which he makes to Buchanan, he, strangely enough, supposes him to accept (in 1886) a "theory" of Andree put forward in the 1900 edition of the 'Handatlas.' Mr. Buchanan, it is true, ascribed the upwelling of cold water to the effect of off-shore winds, whereas it was pointed out by Holway that the prevailing winds off the greater part of the coast of California blow *towards* the shore. Mr. McEwen briefly describes Ekman's theory, which discards Zöppritz's assumption of regular flow in plane layers, making use of a virtual value of the coefficient of viscosity of water, and allowing for its actual turbulent motion, while also taking account of the deflecting force due to the Earth's rotation. Ekman began by considering a series of simple typical problems, which he solved by exact analytical methods, afterwards approaching the actual problems by suitably combining the several typical problems. Adopting the results so gained, Mr. McEwen finds that it follows from the theory that there must be an upwelling of cold bottom water along the American coast under the action of the observed winds. He works out a formula by which the abnormal temperatures of any given region can be computed theoretically, afterwards comparing the results with observed values and finding a very satisfactory agreement. The general conclusion is that the

area affected and the magnitude of the temperature reduction, and its distribution, vary with the depth of the water, the slope of the bottom, the velocity of the winds, the portion of the surface over which they extend, and their steadiness. The cooling effect of the upwelling water extends to a distance of 600 kilometres outwards from Cape Mendocino (40° N.), increasing to one of 2100 kilometres off San Diego (32° 45′ N.). The temperature reduction in summer is at a minimum off San Diego, and at a maximum off Cape Mendocino, where the coldest water is found.

Forests of British Guiana.—A general report on the forests of the easily accessible districts of British Guiana, or those most capable of exploitation under existing conditions, has lately been made by Mr. C. W. Anderson, Forestry Officer, and published at Demerara by the Department of Lands and Mines. The part of the colony dealt with extends from the coast inland for a distance varying from 35 to 110 miles, its limit being marked by the occurrence of rapids impeding navigation on the rivers. It covers about 17,000 square miles, and may be divided into a northern swampy belt of alluvium, and a broader, slightly elevated tract of undulating and hilly country, composed of sandy and clayey deposits derived from the disintegration of the country rocks. While the whole of the Crown forests of British Guiana cover some 78,500 square miles, those of the zone in question occupy about 11,200 square miles, including many swampy depressions and valleys characterized by the growth of various species of palms. The most heavily forested area lies in the north-west, to the westward of the Essequibo, while the largest extent of open savannah country occurs in the eastern coastlands between the Essequibo and the Corantyn, where the chief settlements are situated. Most of the forest vegetation belongs to the class of "rain forest," as defined by Schimper, but it may be divided into two main types in accordance with the natural subdivisions above referred to; each of these being again divisible into classes, according to the differences of situation or soil, though all the subdivisions merge, more or less gradually, one into another. In the alluvial tract slight differences of elevation play the most important part in differentiating the classes; in the more elevated tracts differences of soil. Although the forests are all to be classed as "mixed," many species being common to all the formations, certain kinds are found to predominate in particular areas, and by local custom supply the distinguishing names to the individual forests, *e.g.* "Mora," "Crabwood," "Greenheart," "Wallaba," and "Bullet or Balata tree" forests. This local custom originated with the natives. Of the trees just mentioned, which (with the exception of the "Mora") supply most of the woods exploited commercially, the two first occur chiefly in the lower, the three last in the more elevated areas. The latex of the Balata tree (*Mimusops globosa*) furnishes the substance commercially known by the same name, and next in importance for the yield of latex is the *Sapium Jenmani*, which occurs more particularly on the banks of rivers in the north-west parts of the colony.

Early Man in South America.—The Bureau of Ethnology of the Smithsonian Institution, which in 1906 issued (as *Bulletin* 33) a discussion on "Skeletal Remains suggesting or attributed to Early Man in North America," has recently issued *Bulletin* 52, on "Early Man in South America." Of the researches described, the major part was done by Ales Hrdlička, of the United States National Museum, while the geological work was in charge of Mr. Bailey Willis. The party went to Argentina in 1910, primarily for the purpose of studying the reported evidences of very ancient man in that part of South America. Some time was spent in an examination of skeletal material in

museums before the field studies were begun. The detailed report of the investigation covers nearly 400 pages. There is no doubt that abundant evidence of early men inhabiting southern South America exists, but the investigators failed to find satisfactory evidence favourable to "the hypothesis of man's great antiquity, or to the existence of man's predecessors in South America." They hold that the evidence does not sustain the theory of the evolution of man, or even of the American man, in the southern continent. They believe that the facts gathered show only the presence of an "already differentiated and relatively modern American Indian." The report, however, explicitly states that the verdict is simply that the claims which have been put forth by supporters of the theory of early man and his precursors in South America are "not proven." Mr. Bailey Willis's chapter on the surface geology of the pampas region throws new light on climatic changes in that part of the world. He finds similarities between what evidently went on during the making of the pampean terrane and what is now going on in the building of the great delta plains of eastern China; evidence that the pampas plains are built up of alluvial and wind-blown materials, not of marine sediments; and that there were alternating periods when first fluviatile, and then æolian processes were dominant. The æolian deposits are mainly classified as loess.

Development of Southern Argentina: Routes across the Andes.—In the *Bulletin* of the Pan-American Union for March last there is an account of a trip across the Southern Andes from the Argentine to the Chilean side, which gives an insight into the progress now being made towards the opening up of this long-neglected region. From Neuquen, in the centre of the southern plains (at present the terminus of the railway from Bahia Blanca on the Atlantic coast), three routes lead west or south-west across the Cordillera, the two more northerly being the most used at present. The first, along which a railway is already under construction, goes nearly due west, and enters Chile at the Paso de Pino Hachado. The second, a little further south, arrives at San Martin de los Andes, while the third, followed by the writer in the *Bulletin*, goes south-west by Bariloche, on Lake Nahuel-Huapi, to Puerto Varas, on the Chilean Lake Llanquihue, and so to the coast at Puerto Montt. From Bariloche roads have been made in various directions, that to the east connecting with the railway in course of construction from the Atlantic port of San Antonio. When this line is completed, it will bring the whole East Andean region into touch with the rest of the republic. The writer speaks highly of the country from the point of view both of the settler and (in the case of the Andean districts) of the tourist in search of beautiful scenery.

AUSTRALASIA AND PACIFIC ISLANDS.

French Annexation of the Crozet Islands, Southern Indian Ocean.—We are informed by the Foreign Office that the French Government has assumed the sovereignty of the Crozet group, discovered by the French navigator Marion-Dufresne in 1772, and named after his colleague in the voyage. Crozet was instructed by Marion to land on the largest and take possession in the name of the King of France, whence it has ever since retained the name Possession island, though French sovereignty has hitherto been exercised by no definite act. Possession island is cut by 46° 22′S., 51° 45′E. The group is said to be volcanic and consists of three larger and several smaller islands, the largest measuring about 15 miles by 8. Albatrosses formerly nested in great numbers, and hogs and rabbits have been introduced by voyagers, the former being reported (in former days at least)[1] as savage and dangerous. The

'Narrative of a Voyage to the South Seas,' by Charles M. Goodridge, gives an account of his two years' stay in the group in 1821-1823. Later the Crozets were touched at by Ross, the *Challenger* expedition, and by the United States transit of Venus expedition in 1874. Besides being a resort of sealers, the group also lies not far off the track of the ocean route from this country to Melbourne and New Zealand, and crews of vessels have not unfrequently been cast away on the islands. The best anchorage is in Navire bay, at the east end of Possession island.

Floating Islands in Halemaumau Crater, Hawaii.—Among various papers dealing with special phenomena of volcanoes as observed in Hawaii, Mr. F. A. Perret contributes one to the *American Journal of Science* (March, 1913) on the floating islands of Halemaumau, which present a particularly impressive picture, supported tranquilly on the glowing lake of lava. Small and temporary islands may be formed where a portion of the mass is at rest amid swirling eddies; while occasionally a central cone has been observed, floated upon a rising lava column. Most of the larger islands seem, however, to be due to the fall of great masses from the crater wall, and these, as in the case of one observed and photographed by Mr. Perret in 1911, may persist for a year or more before being finally melted. The phenomenon thus bears a certain analogy to the formation and melting of icebergs, though a different cause for the floatation must be sought, as the solid rock is not of a less specific gravity than the molten. In the first instance, it seems to be due to the surface tension of the molten lava, as in the case of a solid floating upon a liquid by which it is not *wet*. (If incandescent, rocks may be said to amalgamate with the liquid lava, and therefore sink at once.) Rising lava-currents, and the evolution of gas as a result of chemical reaction, may also play their part. The re-fusion of the mass seems to be gradually brought about by the eating away of the lower portions, where the temperature and chemical activity of the molten lava will be greater. In the island of 1911, a large cylindrical cavity was eroded vertically upwards, apparently by a fountain acting on it from below. Grottoes were formed at the surface-level, and, into these, magnificent cascades of the outside lava poured for hours at a time. Vapours evolved during the decomposition of the island escaped by fissures, especially at the summit, and, as it may be supposed that with the widening of the channels a true volcanic chimney might be formed within the previously existing island, Mr. Perret hints at the possibility (though not the probability) of an ordinary mountain becoming a volcano in a similar way. The eventual sinking of such islands seems to be helped by the oscillations of level of the liquid lava (comparable to those of boiling molasses), due to a greater or less supply of gas. A sudden rise does not necessarily carry the solid mass with it, but the shores of the island may be overflowed. When the whole column of lava subsides the island may, on the other hand, be relatively depressed by its own momentum. The final disappearance of the island of 1911 was accompanied by a remarkable phenomenon—the formation of a huge sausage-shaped, gas-inflated balloon of black lava-glass, 170 feet in length, which, propelled across the lake by a lava-fountain, resembled a great whale-back steamer or airship.

POLAR REGIONS.

The Mawson Relief Expedition.—Captain J. K. Davis left London about the middle of July to resume the command of the *Aurora*, and forward the preparations for the new Antarctic voyage to take place towards the end of the year for the relief of Dr. Mawson. He will bring the ship from Hobart to

Melbourne to refit, and will sail direct from the latter port for Dr. Mawson's headquarters in Commonwealth bay during the last week in November. He hopes to be back at Hobart with the whole party by February 1914. Further oceanographical work will be undertaken during the voyage. Of the total sum of £10,000 required to bring the expedition to a conclusion, only about £2600 has yet been raised, including £1000 from His Majesty's Government, £1000 from Sir Robert Lucas Tooth, Bart., £100 each from Lady Scott, Commander Evans, Mr. J. Y. Buchanan, and the Royal Geographical Society, and various smaller amounts, mostly from members of the Scott Expedition. Further donations are therefore urgently needed.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Summer Ice-formation in Caves.—The fact that ice may be found in caverns in the height of summer, in regions where the general temperature at that season is far above the freezing-point, has long been known, and the phenomenon supplied the theme for E. S. Balch's 'Glacières and Freezing Caverns' (Philadelphia, 1900). While the general popular belief (accepted also by some scientific men) is that the ice is *formed* in summer—in fact, that the amount of ice varies with the heat of the summer—others have discredited this idea, regarding the ice as merely the unmelted remains of that formed in winter. One of the most remarkable instances of an "ice-mine" in the United States is that in Sweden valley, Pennsylvania, discovered accidentally in 1898, but still little known away from the locality. It has lately been studied with some care by Mr. M. O. Andrews, of Lehigh University, who visited the mine many times in the winter and spring of 1912, and states the facts observed, with a suggested explanation of their cause, in the *Popular Science Monthly* for March, 1913. Mr. Andrews fully confirms the belief that the ice-formation is most active in summer, reaching a maximum in July. In winter the pit is comparatively dry and free from ice, but with the melting of the snow on the hillside water percolates and is frozen, first as small icicles, eventually as a thick coating on the sides of the pit. Mr. Andrews attributes this result to the circulation of air in the underground fissures. An indraught of cold air in winter reduces the rock temperature within and forms a reservoir of "cold." In summer the process is reversed, and a strong draught of cold air issues from the fissures, being strongest on hot days, which promote the circulation. It maintains a freezing temperature so long as the supply of "cold" in the hill lasts. It is somewhat singular that the writer makes no allusion to excessive evaporation as a factor in the cooling process, though this alone has been considered sufficient in some cases to account for the ice-formation (cf. *Journal*, vol. **18**, p. 307).

GENERAL.

The Panama Canal and its Effects on Commerce.—The approaching completion of the Panama canal has elicited a renewal of discussions of its probable effects on the World's commerce, and though the opinions expressed are naturally to a great extent speculative and divergent, the subject cannot fail to be of extreme interest. The *Journal of the Royal Statistical Society* for March, 1913, contains an elaborate paper by Prof. L. Hutchinson, of California, presenting a detailed analysis of the main factors of the problem. Pointing out that the effect of the canal will be to make more accessible to each other, on the one hand the markets of Europe and the eastern United States (the active factors of the problem, seeking trade)—and on the other all

the countries bordering the Pacific (the passive factors, being traded with), he endeavours to estimate the actual tendencies traceable in recent commercial development; holding that all the canal can do is to accentuate developments already apparent in the regions that will come under its influence. The countries whose trade is being sought, sixteen in all, fall into well-marked groups. All of these, Prof. Hutchinson finds, are increasing their output of goods which Europe and America require; but the greatest latent possibilities of development are to be found in China, Japan, and British Australasia. The tendencies are towards increasing sales of animal fibres, animal food-stuffs, tropical vegetable products, and certain mineral products. These same countries are, as a whole, developing domestic supplies of the cheaper grades of clothing materials; becoming better able (except China and Japan) to supply their own food-stuffs; rapidly increasing their demand for industrial goods, especially manufactures of iron and steel. The competition between the sellers of such goods as these countries require is resulting more and more in the concentration of the trade into the hands of three countries—the United Kingdom, the United States, and Germany. Each of these possesses its own advantages and disadvantages. In the last three periods of five years the share of the United Kingdom has fallen, on the whole, though in some cases greater in the third than the second. Germany has slightly strengthened her position in four groups; while the United States shows a gain in every country except China, having thus made the greatest relative advance of the three. This points, in Prof. Hutchinson's opinion, to a really important advance once the canal is in full operation, for that country stands to gain most from increased accessibility of the markets. In the discussion which followed the paper, some of the speakers urged the importance of other factors (political, etc.) than mere cheapening of freights, and thought that the changes likely to result were sometimes exaggerated. Prof. Hutchinson himself admits that the changes will be by no means so fundamental as those wrought by the Suez canal. On the other hand, Prof. J. Russell Smith, in a short but suggestive paper in the *Journal of Geography* (March, 1913), speaks of the canal as tending to "the greatest readjustment of all time," and as destined to add to, or take from, every one of the great ocean trunk routes. He regards the question rather in reference to the canal's effect on these routes than from the point of view of international competition. The increasing importance of the Pacific liner (as compared with the tramp) renders it necessary to consider especially the position of the *end port* of the chain served by it, which may make it pay to go out by one route and return by another. The opening of the blind alley of the Pacific will probably lead to a round-the-world movement of vessels engaged in the Eastern trade.

OBITUARY.

Philip Lutley Sclater, D.Sc., F.R.S.

THE subject of this notice was born on November 4, 1829, at Tangier Park, near Basingstoke, then the residence of his father, William Lutley Sclater. He was consequently in his eighty-fourth year when he died on June 27 last as the result of a carriage accident. But for the upsetting of a curricle which he was driving at the time (or of any other accident), he might well have lived to be a centenarian, so far as physical and mental vigour went.

It will probably be noted by future historians of the nineteenth and twentieth centuries as one of the many defects in our present system of allotting public honours, that Philip Lutley Sclater should have gone to his grave with many of the distinctions which can be conferred by scientific societies, but without any State recognition of his merits as a zoologist and geographer. He had been a member of the Royal Geographical Society since 1880, and of course it is mainly in the aspect of a Fellow of this Society that these few words of commemoration and regret must be written, as it would be inappropriate to treat in these pages of his great contributions to zoology, more especially to the study of beasts and birds. These will be found dealt with very fully in the *Bulletin* of the United States National Museum (No. 49) published in 1896. But so far as the Royal Geographical Society is concerned, Sclater will remain chiefly noteworthy for his having laid the foundations—so far as English literature is concerned—of a practical system of zoogeography. In 1858 he issued his first essay on the zoogeographical divisions of the world, and the main outlines of his plan have really formed the basis for all future delineations of the distribution of animals over the Earth's surface. At a much later date he returned to this work in concert with his son, William Sclater, and produced a work on the geographical distribution of mammals in which a further attempt was made to define the ocean areas frequented by cetaceans and other large aquatic mammals.

Sclater served several times on the Council of the Royal Geographical Society, and was one of the most frequent attendants at the Society's meetings. He was acquainted with all the great and the less great explorers, and was probably personally answerable for the direction of many a young man's energies towards geographical exploration, in the hope, of course, that he would thereby increase our knowledge of zoology. He had, of course, the intimate acquaintance of all the great biologists of the nineteenth century, but was best known to the world at large as the Secretary, between 1858 and 1902, of the Zoological Society of London. That Society, with its remarkable collection of living animals in Regent's Park, owes more to Sclater than to any one else its world-wide importance as an educational factor. Many of the remarkable beasts and birds discovered during the exploration of the world between 1860 and the present day, owe their scientific nomenclature to Sclater, to whom they were sent in the first instance and from whom they received their diagnosis. His eldest son has served zoology in India, at Capetown, and in the United States, as well as having been for a short time Secretary (in succession to his father) of the Zoological Society of London, and having taken up much of his father's work in connection with the British Ornithologists' Union. The name of another son (Bertram) figured in the pages of this *Journal* and in the earlier history of Nyasaland and Uganda, as that of a noteworthy pioneer in both those British possessions, a Royal Engineer officer charged with survey work and—most notably—with the construction of a road through East Africa to the Victoria Nyanza, which preceded the making of the Uganda railway. Quite apart from his vast amount of work in connection with zoology (and, more especially, ornithology), Philip Lutley Sclater will be remembered in connection with the opening up of Africa to scientific inquiry, as, in addition to his own travels in the northern part of that continent, he did so much by his influence and active support to provoke both the great and small explorations of Africa in the nineteenth century. It only remains to be added that, as a personality, he was almost as well known in France, Holland, Germany, Spain, Portugal, and Italy as in England.

H. H. J.

Francis Fox Tuckett.

In Francis Fox Tuckett, who died at his home at Frenchay, near Bristol, on June 20, in his eightieth year, the Geographical Society has lost one of its oldest members, and the Alpine Club one of the most distinguished of its surviving veterans. Elected to the Alpine Club in 1859, two years after its foundation, Tuckett at once became a pioneer in the scientific exploration of the more remote districts of the Alps. His physical energy appeared inexhaustible and was apt to wear out that both of his companions and guides. It was coupled with an equal mental activity. His elaborate notebooks, his careful outline panoramas, his observations—he climbed girt with instruments—resulted in a very large increase in our knowledge of the mountains and in radical improvements in their cartography. When Mr. John Ball set out on his great task of writing a guidebook to the whole chain of the Alps, which should meet the needs of the man of science and the topographer as thoroughly as those of the climber and tourist, he found in Tuckett an invaluable and almost ubiquitous coadjutor. From that date the initials F. F. T. became a familiar and welcome sign to all frequenters of the High Alps. Yet though Tuckett wrote many papers descriptive of his journeys and ascents—in the second series of 'Peaks, Passes, and Glaciers' there are no fewer than eight, several of a scientific character—they were never collected in a volume in this country. It was left to Leipzig to recognize their solid worth, to translate and to issue them in 1873 as a book under the title of 'Hochalpenstudien.'

In the sixties the Government surveys of many parts of the Alps were vague and inexact. It was in Dauphiné and the Orteler group that Tuckett's endeavours to correct them were the most effectual. In the former district the explorer was exposed, during the careful investigations which he undertook, to hardships which materially affected his health for some years. But there was little pause in his activity. The list of "new" Peaks and Passes credited to him is of the longest, and the items are scattered from the Gross Glockner to Monte Viso. Nor did he confine his travels to the Alps. He visited the Pyrenees, the Apennines, Greece, Corsica, and Algeria. The *Alpine Journal* is full of the records of his wanderings.

When the years of climbing were past, Tuckett's love of travel took him to all parts of the Earth. He sailed round the world three times, noting the cities and manners of men as well as mountains, visiting Syria, India, China, Japan, South Africa, North and South America, Australia, and New Zealand. He went to Egypt repeatedly, and became intimate with the leading Egyptologists.

An ardent antiquary, he was a regular attendant at the meetings of Archæological Associations. The width of his interests was exceptional; he was an omnivorous reader, and he made the most of all the opportunities of travel. His mind was consequently stored with a mass of ordered information which he was always ready to pour out to his friends, whether in conversation or through a voluminous correspondence. With his later journeys he kept them in close touch by the admirable photographs which he brought home from the most out-of-the-way and picturesque corners of the Earth. His varied attainments were to a great extent concealed from the public eye by a retiring disposition which shrank from public speaking and any kind of notoriety. But his loss will be felt while any of his friends live, and his memory will last as long as the Alps remain, what he with John Ball, Tyndall, Whymper, and Leslie Stephen helped to make them, "the Playground of Europe."

The Italian order of St. Maurice and St. Lazarus was conferred on Tuckett by Victor Emmanuel. He more than once refused the Presidency of the Alpine Club.

In 1896 he married Alice, daughter of Dillworth C. Fox, of Wellington, who was the companion of all his later journeys, and survives him. He returned from his last tour of the world only a fortnight before his death, which was caused by a chill caught during a foggy voyage across the Atlantic.

D. W. F.

J. Logan Lobley.

Mr. James Logan Lobley, who passed away on June 27, in the eightieth year of his age, was a native of Liverpool, who had spent the greater part of his life in London, where he acquired at one time considerable reputation as a teacher of geology and certain allied subjects. Among his many writings, the most valuable was his monograph on Mount Vesuvius—a comprehensive work which, though not published until 1889, was an expansion of a paper that he read at the Geologists' Association in 1868, after a visit to the volcano during a rather violent phase of the long-continued eruption of that year. Mr. Lobley was for many years professor of physiography, astronomy, and agriculture at the City of London College, and was the author of many scientific papers read before the Geological Society, the British Association, the Geologists' Association, the Victoria Institute, and the Scientific Society of the City of London College. An excellent little work on Hampstead Hill was also the product of his active pen. On more than one occasion he visited Spain for the purpose of examining the deposits of phosphate of lime of Estremadura. As a student of fossils he undertook a rather elaborate examination of the distribution of the fossil Brachiopoda and Lamellibranchiata throughout the British strata. Clear and fluent as an expositor of the facts and principles of geology, Mr. Lobley made an excellent demonstrator, especially in the field, and he was never happier than when conducting a geological excursion. Many a young traveller, indeed, owed to him an introduction to the methods of field observation and geological surveying. Not long before his death, he published a volume of verses entitled 'The Tour and Other Poems.' This volume contained a large number of sonnets recalling his visits to various localities in the British Isles and on the continent of Europe, and giving evidence in many ways of the activity of his intellect, the versatility of his tastes, and the general kindliness of his nature.

Captain B. E. A. Pritchard.

It is with great regret that we record the death—from drowning, during an expedition on the Burmo-Chinese borderland—of Captain B. E. A. Pritchard, an officer who had already shown much promise as an explorer of the little-known borderlands of North-East India. Born on May 24, 1876, he entered the army, and joined the 83rd Wallajabad Light Infantry. He was a linguist of considerable attainments, having passed as an interpreter in Russian, and having acquired a considerable acquaintance with many of the languages of the north-eastern frontier of India, besides Tamil, Hindostani, and (to some extent) Persian. His bent lay rather in the direction of travel and adventure than of regimental routine, and about two years ago he planned an important expedition on the north-eastern frontier of Burma, along the Irawadi-Salwin divide. He was accompanied by a surveyor of the Survey of India, and brought back much useful information from this little-known region. On his return he

gave a lecture at Simla, and was awarded the Macgregor Medal of the United Service Institution of India. After a stay of a few months at Simla, he obtained fresh leave, in the summer of 1912, for a new expedition, the object of which was to further extend our knowledge of the Burmese border north of Kamptilong, along the Irawadi-Salwin divide and on towards the Lohit branch of the Brahmaputra. He was accompanied by Captain Waterfield, of the 45th Sikhs, who returned alone to Myitkyana, reporting that Captain Pritchard was drowned on May 6 while trying to swim across the Taran river.* Captain Waterfield tried to push on, but was forced by floods to turn back, and made his way to Burma after enduring much hardship.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1912–1913.

Seventeenth Meeting, June 23, 1913.—The Right Hon. Earl Curzon of Kedleston, G.C.S.I., G.C.I.E., etc., in the Chair.

Elections.—*Henry Birchenough, C.M.G.; Charles Wm. Booth; H. S. Brown; Raymond de Candolle; Mrs. E. I. Cunliffe; The Countess of Dartrey; Robert Davidson; Miss Effie L. Dawson; Right Hon. Lord Devonport; William J. Fanning; Major Patrick W. Forbes; Miss Maud Elizabeth Harrop; H. Lenton, B.A.; Mrs. Alan Lupton; W. R. Malcolm; John Cyril Moinet; Evelyn M. Oswald; Assheton Pownall; Henry H. Saylor; Mrs. Swann; Miss Ellen G. Tanner; Lieut. Thomas Charles N. Thompson, R.N.R.; Captain F. A. Whitehead, R.N.; Rodney Carrington Wood.*

The paper read was:—

"Geographical Excursion across the United States." By Messrs. G. G. Chisholm; H. O. Beckit; and Alan G. Ogilvie.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

* The Taran is shown on the maps as a tributary of the Chindwin.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps, Eastern. **Krebs.**

Länderkunde der Oesterreichischen Alpen. Von Dr. Norbert Krebs. (Bibliothek länderkundlicher Handbücher, herausgegeben von Prof. Dr. Albrecht Penck.) Stuttgart: J. Engelhorn, 1913. Size 9 × 6, pp. xv. and 557. *Maps, Illustrations, and Sections. Price M.20. Presented by the Publisher.*

Alps—Meteorology. *Z. Deuts. Oesterr. Alpenvereins* **43** (1912): 53–77. **Ficker.**

Die Erforschung der Föhnerscheinungen in den Alpen. Eine meteorologische Studie. Von H. v. Ficker. *Diagrams.*

Austria-Hungary. *National G. Mag.* **23** (1912): 1188–1217. **Iddings.**

The land of contrast: Austria-Hungary. By D. W. and A. S. Iddings. *Sketch-map and Illustrations.*

Balkan Peninsula—Novibazar. *G.Z.* **19** (1913): 39–42. **Kellner.**

Der Sandschak Novibazar und seine volkswirtschaftlichen Verhältnisse. Von W. Kellner.

Denmark—Archæology. **Müller.**

Aarbøger for Nordisk Oldkyndighed og Historie, 1911: 233–275, 276–320.

Vendsyssel-Studier. I. Bebyggelsens forhold til Sted og Natur. II. Sten- og Bronzealderens Mindesmaerker og Fund. Av Sophus Müller. *Sketch-maps and Illustrations.*

The first part deals with the relation of the settlements to the physical character of their sites.

France—Loire. **Goldring.**

The Loire: the record of a pilgrimage from Gerbier de Joncs to St. Nazaire. By Douglas Goldring. London: Constable & Co., 1913. Size 8½ × 5½, pp. xxii. and 332. *Map and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

A pleasantly written popular account, forming a companion volume to that on the Moselle by Charles Tower (see below).

Germany—Black Forest. **Seydlitz.**

Der Schwarzwald: Bergstrasse, Neckartal, der Hegau bis zum Bodensee, der Kaiserstuhl und Strassburg. Von Dr. G. von Seydlitz. 15. Auflage. Bern: Geographischer Kartenverlag, 1913. Size 6 × 4, pp. 328. *Maps and Plans. Price M.3.35. Presented by the Publishers.*

Germany—Ethnology. **Schulz.**

Das Germanische Haus in vorgeschichtlicher Zeit. Von Dr. Walther Schulz. (Mannus-Bibliothek; herausgegeben von Prof. Dr. Gustaf Kossinna, Nr. 11.) Würzburg: C. Kalitzsch, 1913. Size 10½ × 7, pp. viii. and 128. *Illustrations. Price M.4. Presented by the Publisher.*

Germany—Moselle. **Tower.**

The Moselle. By Charles Tower. London: Constable & Co., 1913. Size 8½ × 5½, pp. x. and 332. *Maps and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

Italian Alps. **Butler.**

Alps and sanctuaries of Piedmont and the Canton Ticino. By Samuel Butler. New and enlarged edition. London: A. C. Fifield, 1913. Size 8 × 5½, pp. 335. *Illustrations. Price 5s. net. Presented by the Publisher.*

Mediterranean Lands. **Fischer.**

Mittelmeerbilder: gesammelte Abhandlungen zur Kunde der Mittelmeerländer. Von Dr. Theobold Fischer. 2. Auflage, besorgt von Dr. Alfred Rühl. Leipzig, etc.: B. G. Teubner, 1913. Size 8 × 5½, pp. vi. and 472. *Portrait. Price M.7. Presented by the Publisher.*

Pyrenees. **O'Connor.**

Travels in the Pyrenees, including Andorra and the coast from Barcelona to Carcasonne. By V. C. Scott O'Connor. London: John Long, Ltd., 1913. Size

9 × 5½, pp. 348. *Map and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Pyrenees. **Sorre.**

Maximilien Sorre. Les Pyrenées méditerranéennes; étude de géographie biologique. Paris: A. Colin, 1913. Size 10 × 6½, pp. 508. *Maps, Illustrations, and Diagrams. Price* 12 *fr. Presented by the Publisher.*

Russia. **Semenoff and Lamansky.**

Russia. Complete geographical description of our country. Edited by V. P. Semenoff-Tian-Shansky; with contributions by P. P. Semenoff-Tian-Shansky and V. I. Lamansky. Vol. 2: The Black Earth region of Central Russia (pp. viii. and 717); vol. 3: The Lakes region (pp. ix. and 456); vol. 6: The region of the Middle and Lower Volga (pp. vii. and 599); vol. 7: Little Russia (pp. ix. and 518); vol. 9: Region of the Upper Dniepr and White Russia (pp. vii. and 620); vol. 14: New Russia and the Crimea (pp. viii. and 983); vol. 16: Western Siberia (pp. viii. and 591); vol. 18: The Kirghiz region (pp. viii. and 479). St. Petersburg: A. F. Defrina, 1900–1910. Size 9 × 6. *Maps and Illustrations. Purchased.* [In Russian.]

Will form the best systematic description of the Russian Empire yet published.

Russian Empire—Statistics. **Kennard.**

The Russian Year-Book for 1913. Compiled and edited by Howard P. Kennard, assisted by Netta Peacock. London: Eyre & Spottiswoode, [1913]. Size 8 × 5½, pp. xx. and 810. *Sketch-maps and Diagrams. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Scandinavia. **Rabot.**

La Scandinavie (Norvège, Suède, Danemark, Islande). Par Charles Rabot. Paris: Bong et Cie., [1913]. Size 15 × 11½, pp. 68. *Maps and Illustrations. Presented by the Author.*

Extracted from the new 'Illustrated Geography,' edited by Onesime Reclus, in course of publication.

Switzerland. **Avebury.**

The scenery of Switzerland and the causes to which it is due. By the Rt. Hon. Lord Avebury. 5th edit. London: Macmillan & Co., 1913. Size 8 × 5, pp. xxxi. and 501. *Maps, Sections, and Illustrations. Price* 6*s. Presented by the Publishers.*

This well-known work remains essentially the same as on its first appearance in 1896, though certain additions and modifications have been introduced in successive editions. Some new illustrations have been supplied and others redrawn, and an index has been added. One or two chapters (particularly that on the Outer Alps and their overthrusts) have been rearranged.

United Kingdom—Birmingham—Water-supply. **Mansergh.**

Min. of P.I. Civil Engineers **190** (1912): 3–88.

The works for the supply of water to the city of Birmingham from Mid-Wales. By Ernest Lawson Mansergh and Walter Leahy Mansergh. *Sketch-maps, Diagrams, Sections, and Illustrations.*

United Kingdom—Dartmoor. **Reid and others.**

Memoirs of the Geological Survey. England and Wales. Explanation of Sheet 338. The geology of Dartmoor. By Clement Reid, G. Barrow, R. L. Sherlock, and others. London: Darling & Son, 1912. Size 9½ × 6, pp. vi. and 102. *Illustrations and Sections.*

United Kingdom—Durham—Geology. **Woolacott.**

The stratigraphy and tectonics of the permian of Durham (northern area). By Dr. D. Woolacott. (Extract from the *Proceedings* of the University of Durham Philosophical Society, vol. 4, Part 5, 1911–12.) Newcastle-upon-Tyne, 1912. Size 9 × 5½, pp. 241–313. *Sketch-maps, Sections, and Illustrations.*

United Kingdom—Geology. *Geol. Mag.*, Dec. V. **10** (1913): 62–70. **Jukes-Browne.**

On some Chalk pebbles from the floor of the English Channel. By A. J. Jukes-Browne. *Sketch-map.*

United Kingdom—Hampshire. **White.**

Memoirs of the Geological Survey. England and Wales. Explanation of Sheet 299. The geology around Winchester and Stockbridge. By H. J. Osborne White. London: Darling & Son, 1912. Size 9½ × 6, pp. iv. and 90. *Sections.*

United Kingdom—Ireland—Rainfall. *Symons's Met. Mag.* **47** (1913): 235–239. **Smyth.**

Rainfall on the River Bann, County Down, Ireland, at Banbridge and Lough Island Reavy Reservoir, for fifty years, from 1862 to 1911. By John Smyth.

United Kingdom—Jersey—Anthropology. *Archæologia* **63** (1912): 203–230. **Marett.**

Further observations on Pre-historic man in Jersey. By R. R. Marett. *Diagrams and Illustrations.*

United Kingdom—London. *Archæologia* **63** (1912): 257–344. **Norman and Reader.**

Further discoveries relating to Roman London, 1906–12. By Philip Norman and Francis W. Reader. *Plans, Sections, and Illustrations.*

United Kingdom—Scotland—Lothians. **Carruthers and others.**

Memoirs of the Geological Survey, Scotland. The oil-shales of the Lothians. Part I. The geology of the oil-shale fields. By R. G. Carruthers, based on the work of H. M. Cadell and J. S. Grant Wilson. Part II. Methods of working the oil-shales. By W. Caldwell. Part III. The chemistry of the oil-shales. By D. R. Steuart. Second edit. Edinburgh, 1912. Size 9½ × 6, pp. x. and 200. *Map, Illustrations, and Diagrams. Price* 2*s.* 6*d.*

United Kingdom—Sussex—Coast Defence. **Owens and Wood.**

P.I. Civil Engineers **189** (1912): 292–309.

Reinforced concrete sea defences. By Dr. John Switzer Owens and Frederick James Wood. *Plans and Sections.*

Western Europe. **Davis and others.**

Eine geographische Studienreise durch das westliche Europa. Von W. Hanns, A. Rühl, H. Spethmann, H. Waldbaur; mit einer Einleitung von W. M. Davis. Leipzig, etc.: B. G. Teubner, 1913. Size 9½ × 6½, pp. iv. and 76. *Sketch-maps and Illustrations. Price M.*2.40. *Presented by the Publisher.*

ASIA.

Central Asia—Tian-Shan. *G.Z.* **19** (1913): 1–20. **Merzbacher.**

Die Physiographie des Tian-schan. Von Gottfried Merzbacher. *Illustrations.*

China—Hwang-ho. **Menauer.**

Die Laufänderungen des Gelben Flusses in historischer Zeit. Von Dr. Jakob Menauer. Nürnberg: C. Koch, 1912. Size 9 × 6, pp. vi. and 72. *Maps. Price M.* 1.50.

Chinese Empire—Mongolia. *Fennia* **28** (1909–10): 1–230. **Granö.**

Beiträge zur Kenntnis der Eiszeit in der Nordwestlichen Mongolei und einigen ihrer Südsibirischen Grenzgebirge. Geomorphologische Studien aus den Jahren 1905, 1906, 1907, and 1909. Von J. G. Granö. *Maps, Sections, and Illustrations.*

Chinese Empire—Tibet. **Duncan.**

A summer ride through Western Tibet. By Jane E. Duncan. [Reprint, with a memoir of the Author.] London, etc.: Collins, [1913]. Size 6½ × 4, pp. 316. *Portrait and Illustrations. Presented by J. A. Duncan, Esq.*

See review of the original work in vol. 29, p. 75.

Chinese Empire—Tibet. **Ward.**

The land of the blue poppy: travels of a naturalist in Eastern Tibet. By F. Kingdon Ward. Cambridge: University Press, 1913. Size 9½ × 6½, pp. xii. and 283. *Maps and Illustrations. Price* 12*s. net. Presented by the Publishers.*

Chinese Empire—Tibet. *Geol. Mag.* V. **10** (1913): 148–153. **Ward.**

Geological notes on the "Land of Deep Corrosions." By F. Kingdon Ward. *Illustrations.*

See note in the June number, p. 586.

Dutch East Indies—Meteorology. **Bemmelen.**

Die Erforschung des tropischen Luftozeans in Niederländisch-Ost-Indien. Von Dr. W. van Bemmelen. (Luftfahrt und Wissenschaft . . . herausgegeben von Joseph Sticker; Heft 5.) Berlin: J. Springer, 1913. Size 11 × 8, pp. viii. and 50. *Illustrations. Price M.*2.40. *Presented by the Publisher.*

Eastern Asia—Anthropology. *Smithsonian Misc. Coll.* **60** (1912): No. 16, pp. 6. **Hrdlička.**

Remains in Eastern Asia of the race that peopled America. By Dr. A. Hrdlička. *Illustrations.*

See note in the July number, p. 76.

India—Madras. **Love.**

Indian Records Series. Vestiges of Old Madras, 1640–1800. Traced from the East India Company's records preserved at Fort St. George and the India Office, and from other sources, by Henry Davison Love. 4 vols. London: John Murray, 1913. Size 9½ × 6, pp. (vol. 1) xvi. and 594; (vol. 2) viii. and 624; (vol. 3) viii. and 580; (vol. 4) 198. *Plans and Illustrations (facsimile and original).* *Price 36s. net.* *Presented by the Publisher.*

India—Survey. **Survey of India.**

Levelling of precision in India: Heights of bench-marks. [*To be published for the whole of India; various sheets now issued.*] Dehra Dun, 1911 and on. Size 10½ × 8½. *Maps.* *Presented by the Survey of India.*

Russia—Caucasus. *Zemlevedenie* **19** (1912): 211–220. **Preobrajenski.**

Four ascents to the top of Kazbek. By M. Preobrajenski. *Illustrations.* [In Russian.]

Ascents by two ladies.

Russia—Caucasus—Gravity. **Korzun.**

Zap. Milit.-Topogr. Sect. General Staff **66**, Sect. 2 (1911): 37–59.

On the determination of the force of gravity in the Caucasus in 1909. By Lieut.-Colonel Korzun. [In Russian.]

Russia—Sakhalin. *Zemlevedenie* **19** (1912): 80–162. **Sokoloff.**

Russian Saghalin. By D. Sokoloff. [In Russian.] *Sketch-map and Illustrations.*

Russia—Siberia. *Iz. Imp. Russ. G.S.* **48** (1912): 67–100. **Perfilieff.**

Two ascents of the volcano of Mount Wacha, Kamchatka. By B. V. Perfilieff. *Illustrations.* [In Russian.]

Russia—Siberia. *Iz. Imp. Russ. G.S.* **48** (1912): 129–188. **Rodevich.**

The Uriankhanski district, Mongolia, and its inhabitants. By V. Rodevich. *Map and Illustrations.* [In Russian.]

Russia—Siberia—Arctic Coast. *Iz. Imp. Russ. G.S.* **48** (1912): 343–355. **Kozhevnikoff.**

Route-surveys and conditions of exploration in the region of the coast of the Northern Arctic ocean. By M. Kozhevnikoff. *Illustrations.* [In Russian.]

Russia—Siberia—Climate. *Zap. on Hydrography* **33** (1911): 123–153. **Shostakovich.**

Temperature of rivers in Siberia and quantity of heat carried by them into the Arctic Ocean. By V. Shostakovich. [In Russian.]

Russia—Siberia—Khatanga. **Kozhevnikof.**

Zap. Milit.-Topogr. Sect. General Staff **64**, Sect. 1 (1910): 77–100.

Route survey of the basin of the river Khatanga. By Captain — Kozhevnikoff. *Map and Illustrations.* [In Russian.]

Russia—Siberia—North-Eastern. **Tolmachef.**

Materials for the knowledge of the paleozoic deposits of North-Eastern Siberia. By I. P. Tolmachef. (From *Travaux du Musée Géologique Pierre le Grand, Académie des Sciences St. Pétersbourg*, Tome vi., 1912.) Size 10 × 6½, pp. 123–150. *Illustrations.*

Russia—Siberia—Phytogeography. *Zemlevedenie* **19** (1912): 63–79. **Noropokrovski.**

Botanico-geographical researches in the Nerchinsk and Chitinsk districts of the Baikal region during the summer of 1908. By I. Noropokrovski. *Sketch-map and Illustrations.* [In Russian.]

Russia—Siberia—Survey. **Pavloff.**

Zap. Milit-Topogr. Sect. General Staff **66**, Sect. 2 (1911): 1–32.

Measurement of the Omsk base by the Jäderin method in 1909. By Colonel — Pavloff. [In Russian.]

Russia—Siberia—Survey. **Selivertsoff.**

Zap. Milit. Topogr. Sect. General Staff **66**, Sect. 2 (1911): 191–209.

Determination of longitudes by azimuth. [Between Vladivostok and Khabarovsk.] By Colonel — Selivertsoff. *Map.* [In Russian.]

Russia—Siberia—Western. *Iz. Imp. Russ. G.S.* **48** (1912): 23–66. **Meffert.**

Sketch of the country adjoining the northern part of Lake Balkhash and the western coast of the lake. By B. F. Meffert. *Sketch-map and Illustrations.* [In Russian.]

Russia—Siberia—Yalmal peninsula. **Shitkoff.**
Zap. on Hydrography **33** (1911): 239–269.
The Yalmal peninsula. By B. Shitkoff. [In Russian.]
Cf. note in vol. **39**, p. 73.

Russian Turkestan. *Iz. Imp. Russ. G.S.* **48** (1912): 101–128. **Molchanoff.**
Journey to the delta of the Amu-Daria during the summer of 1911. By L. A. Molchanoff. *Sketch-map.* [In Russian.]

Russian Turkestan. *Iz. Imp. Russ. G.S.* **48** (1912): 281–292. **Mushketoff.**
The glacier region of Eastern Ferghana. By D. Mushketoff. *Sketch-map and Illustrations.* [In Russian.]

Russian Turkestan. *Iz. Com. Géol. Russie* **30** (1911): 791–845. **Mushketof.**
Le Ferghana oriental. Par D. Mouchketow. *Map and Sections.* [In Russian; French *résumé*.]

Russian Turkestan. *Iz. Imp. Russ. G.S.* **47** (1911): 319–369. **Preobrajenski.**
Journey to the Turkestan mountain ridge (Zerafshan, Lyailyak, Isfar and Sokha basins). By I. Preobrajenski. *Sketch-map, Sections, and Illustrations.* [In Russian.]

Turkey—Palestine—Askelon. **Mackenzie.**
Palestine Explor. Fund, Quart. Statement (1913): 8–23.
The Philistine city of Askelon. By Dr. Duncan Mackenzie. *Plan and Section.*

Turkey—Kalimno. **Stefani.**
Atti R.A. Lincei, Ser. V., Rendiconti A. Sc. fisiche **21** (1912): 2. *Sem.*, 479–486.
Calimno: cenni geologici. Di Carlo di Stefani.

Turkey—Rhodes. **Jaja.**
B.S.G. Italiana **1** (1912): 735–774, 874–889, 966–1003, 1081–1114.
L'isola di Rodi. Del Prof. Goffredo Jaja. *Sketch-maps.*

AFRICA.

Abyssinia—Historical. **Krause.**
Die Portugiesen in Abessinien. Ein Beitrag zur Entdeckungsgeschichte von Africa. Von Dr. Kurt Krause. (Erscheint zugleich als 6. Heft der 'Mitteilungen des Vereins für Erdkunde zu Dresden,' Jahrgang 1912.) Dresden, 1912. Size 9 × 6, pp. 118. *Sketch-map.*

Africa—Historical. **Simar.**
La géographie de l'Afrique Centrale dans l'antiquité et au moyen age. Par Th. Simar. Brussels: Vromant et Cie., 1913. Size 9½ × 6, pp. 133. *Facsimile maps. Presented by the Publishers.*

Africa—Railways. **Baltzer.**
Die Erschliessung Afrikas durch Eisenbahnen. Von F. Baltzer. Berlin: D. Reimer, 1913. Size 9½ × 6½, pp. 36. *Map. Price M.1. Presented by the Publisher.*

Angola. **Grimaud.**
La G., B.S.G. Paris **26** (1912): 110, 203–207, 359–361; **27** (1913): 45–48.
Mission Rohan-Chabot dans l'Angola. Par Capitaine Grimaud.

Belgian Congo—Ethnology. **Engels.**
Les Wangata (tribu du Congo Belge). Étude ethnographique, par le Lieut. Engels. Brussels: Vromant et Cie., 1912. Size 10 × 6½, pp. 104. *Map and Illustrations. Presented by the Publishers.*

East Africa. *Naturw. Wochenschrift* **28** (1913): 17–21. **Krenkel.**
Die ostafrikanische Bruchzone. Von E. Krenkel.

East Africa. *M. deuts. Schutzgebieten, Erganzungsheft* Nr. **6** (1913): pp. 128. **Meyer.**
Ergebnisse einer Reise durch das Zwischenseengebiet Ostafrikas 1911. Von Hans Meyer. *Maps and Illustrations.*

Egypt. *Cairo Scientific J.* **7** (1913): 22–24. **Murray.**
Gebel Hammâm Farûn. By G. W. Murray. *Diagram.*

Nigeria. **M'Keoun.**

Twenty-five years in Qua Iboe. The story of a missionary effort in Nigeria. By Robert L. M'Keoun. London: Morgan & Scott, 1912. Size 7½ × 5, pp. vii. and 170. *Map and Illustrations. Price* 2*s.* 6*d. Presented by the Author.*

Portuguese East Africa. **Lyne.**

Mozambique: its agricultural development. By Robert Nunez Lyne. London: T. Fisher Unwin, [1913]. Size 9 × 5½, pp. 352. *Map and Illustrations. Price* 12*s.* 6*d. net. Presented by the Author.*

Portuguese West Africa. **Nascimento.**

Governo Geral da Provincia de Angola. Relatorio da missão de colonisação no planalto de Benguella em 1909. [Pelo Dr. J. Pereira do Nascimento.] Loanda, 1910. Size 9½ × 6½, pp. 158. *Maps and Diagrams. Presented by Dr. J. W. Gregory.*

Rhodesia—Language. **Madan.**

Lala-Lamba-Wisa and English, English and Lala-Lamba-Wisa Dictionary. By A. C. Madan. Oxford: Clarendon Press, 1913. Size 7 × 4½, pp. 328. *Price* 10*s.* 6*d. net. Presented by the Publishers.*

Sierra Leone and French New Guinea—Boundaries. ——

Treaty Series, 1912. No. 9. Exchange of notes between the United Kingdom and France respecting boundaries between Sierra Leone and French Guinea, London, July 6, 1911. London: Wyman & Sons, 1912. Size 9½ × 6, pp. 139–142. *Map.*

See *Journal*, vol. 40, p. 643.

South Africa. ——

The Government of South Africa. 2 vols. Cape Town: Central News Agency, 1908. Size 10 × 7½, pp. (vol. 1) xiv. and 466; (vol. 2) vi. and 424. *Maps.*

South Africa—Basuto. **Ellenberger.**

History of the Basuto, ancient and modern. Compiled by Dr. Fred Ellenberger, and written in English by J. C. MacGregor under the auspices of the Basutoland Government. London: Caxton Publishing Company, 1913. Size 9 × 6, pp. xxii. and 396. *Portrait. Price* 7*s.* 6*d. net. Presented by the Publishers.*

South Africa—Mines. *P. Rhodesia Sc. Assoc.* 11 (1911–12): 168–181. **Fripp.**

An engineer's notes on old mine-workings of Transvaal and Rhodesia. By T. E. B. Fripp.

Sudan—Ethnology. **Rattray.**

Hausa folk-lore, customs, proverbs, etc., collected and transliterated, with English translation and notes, by R. Sutherland Rattray. 2 vols. Oxford: Clarendon Press, 1913. Size 9½ × 6½, pp. (vol. 1) xxiv. and 328; (vol. 2) 316. *Illustrations. Price* 30*s. net. Presented by the Publishers.*

Sudan—Fertit. **Modat.**

Renseignements Col., Afrique Française (1912): 177–198, 218–239, 270–289.

Une tournée en pays Fertyt. Par le Capitaine Modat. *Sketch-maps, Diagrams, and Illustrations.*

The country on the borders of French and Anglo-Egyptian territory (see *Journal*, February, 1913, p. 166).

Tripoli. *B.S.G. Italiana* 1 (1912): 841–873, 1004–1028. **Ricchieri.**

Libia interna. Del prof. Giuseppe Ricchieri. *Sketch-maps and Illustrations.*

Tunis. **Monchicourt.**

Ch. Monchicourt. La région du Haut Tell en Tunisie (Le Kef, Téboursouk, Mactar, Thala). Essai de monographie géographique. Paris: A. Colin, 1913. Size 10 × 6½, pp. xiv., 487, and xvii. *Map and Illustrations. Price* 12 *fr. Presented by the Publisher.*

Uganda—Boundary. ——

Uganda. Report on the work of the British section of the Anglo-German-Belgian Boundary Commission, 1911. London: Wyman & Sons, 1912. Size 13 × 8½, pp. 32. *Diagrams, Maps, and Illustrations.*

Victoria Nyanza—Zoogeography. *C.R.A. Sc. Paris* 155 (1912): 1544–1546. **Pellegrin.**

Nouvelle contribution à la faune ichthyologique du lac Victoria. Par Jacques Pellegrin.

Wadai—Abeshe. *Renseignements Col., Afrique Française* (1912): 349–370. **Ferrandi.**
Abéché, Capitale du Ouadai. Par le Lieut. J. Ferrandi. *Sketch-map and Illustrations.*

NORTH AMERICA.

California—Rainfall. **Reed.**
Univ. California Publ. in Geography **1**, No. 2 (1913): 64–79.
The Rainfall of Berkeley, California. By William Gardner Reed. *Sketch-map and Illustrations.*

California—River. **Holway.**
Univ. California Publ. in Geography **1**, No. 1 (1913): 1–60.
The Russian River. A Characteristic Stream of the California Coast Ranges. By Ruliff S. Holway. *Maps and Illustrations.*

Mexico. **Baerlein.**
Mexico, the land of unrest: being chiefly an account of what produced the outbreak in 1910, together with the story of the revolutions down to this day. By Henry Baerlein. London: Herbert & Daniel, 1913. Size 9 × 6, pp. xxiv. and 461. *Map and Illustrations. Price* 16*s. net. Presented by the Publishers.*

United States—Missouri river. **Emerson.**
B. American G.S. **44** (1912): 674–681, 761–768.
Life along a graded river. By F. V. Emerson. *Sketch-maps and Diagrams.*

United States—Montana—Geology. **Weed.**
U.S. Geol. Surv. Professional Paper **74** (1912): pp. 262.
Geology and ore-deposits of the Butte district, Montana. By Walter Harvey Weed. *Maps, Illustrations, Sections, and Diagrams.*

United States—New Hampshire. *American J. Sc.* **35** (1913): 1–19. **Goldthwait.**
Glacial Cirques near Mount Washington. By J. W. Goldthwait. *Contour-maps and Illustrations.*
See note in the Monthly Record, May, 1913, p. 490.

United States—Pennsylvania. **Whidden and Schoff.**
Pennsylvania and its manifold activities. Prepared by Guy C. Whidden and Wilfred H. Schoff, for the 12th International Congress of Navigation. Philadelphia, 1912. Size 9½ × 6, pp. 288. *Maps and Illustrations.*

United States—Philadelphia. **Macfarlane.**
Manufacturing in Philadelphia, 1683–1912. By John J. Macfarlane. Published by the Philadelphia Commercial Museum. Philadelphia, 1912. Size 9½ × 6, pp. 98. *Illustrations and Diagrams.*

United States—Philadelphia. **Taylor and Schoff.**
The Port and City of Philadelphia. Prepared by Frank H. Taylor and Wilfred H. Schoff for the 12th International Congress of Navigation. Philadelphia, 1912. Size 9½ × 6, pp. 160. *Plan and Illustrations.*

United States—Rockies. **Mills.**
The spell of the Rockies. By Enos A. Mills. London: Constable & Co., 1912. Size 8½ × 5½, pp. xii. and 356. *Illustrations. Price* 6*s. net. Presented by the Publishers.*

United States—Survey. **Bowie.**
Department of Commerce and Labor. Coast and Geodetic Survey. Geodesy. Special publication No. 11. The Texas-California arc of primary triangulation. By William Bowie. Washington, 1912. Size 11 × 9, pp. 142. *Sketch-maps and Illustrations.*

United States—Wisconsin—Meteorology. **Kimball and Miller.**
B. Mount Weather Observatory **5** (1912): 173–183.
Solar radiation intensities at Madison, Wisconsin. By Herbert H. Kimball and Eric R. Miller.

CENTRAL AND SOUTH AMERICA.

Argentine—Paraná. **De Carles.**
Ann. Museo Nacional Historia Natural Buenos Aires **23** (1912): 245–252.
Relación acerca de los yacimientos fosíliferos de Arroyo Frias y sedimentos de las barrancas del río Paraná al norte y sur de Santa Fé. Por Enrique de Carles. *Illustrations.*

Bolivia—Railway. *B. American G.S.* **45** (1913): 275–281. **Bowman.**
Geographical Aspects of the New Madeira-Mamore Railway. By Isaiah Bowman. *Sketch-map.*

Central America. **Putnam.**
The Southland of North America: rambles and observations in Central America during the year 1912. By George Palmer Putnam. New York and London: G. P. Putnam's Sons, 1913. Size 8½ × 5½, pp. xiv. and 426. *Sketch-maps and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publisher.*

Chile. **Koebel.**
Modern Chile. By W. H. Koebel. London: G. Bell & Sons, 1913. Size 8½ × 5½, pp. x. and 278. *Map and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Chile—Minerals. **Oficina Central de Estadistica.**
Oficina Central de Estadistica. Anuario Estadístico de la República de Chile. Minería y metalurgia. Año 1911. Santiago de Chile, 1912. Size 10½ × 7½, pp. x. and 94.

Colombia. **Isaza and Marroquín.**
Primer Centenario de la Independencia de Colombia, 1810–1910 (Por Emiliano Isaza y Lorenzo Marroquín.) Bogotá, 1911. Size 14 × 10, pp. x. and 420. *Plan and Illustrations. Presented by the Ministerio de Relaciones Exteriores.*

Costa Rica—Seismology. ——
Anales del Centro de Estudios Sismológicos de Costa Rica, año 1911. San José, [1912]. Size 11½ × 8½, pp. 66. *Illustrations.*

Panama Canal. *B. American G.S.* **45** (1913): 241–254. **Herbert.**
The Panama Canal: its Construction and its Effect on Commerce. By John W. Herbert. *Sketch-map and Illustrations.*

Panama Canal. **Mills.**
The Panama Canal: a history and description of the enterprise. By J. Saxon Mills. London: T. Nelson & Sons, [1913]. Size 7½ × 5, pp. 344. *Sketch-map and Illustrations. Price* 2*s. net. Presented by the Publishers.*

Peru—Urubamba. *B. American G.S.* **44** (1912): 881–897. **Bowman.**
The cañon of the Urubamba. By Isaiah Bowman. *Maps and Illustrations.*
See note in the Monthly Record, May, 1913.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Exploration. **Fitchett.**
The New World of the South; Australia in the making. By Dr. W. H. Fitchett. London: Smith, Elder & Co., 1913. Size 8 × 5, pp. xiv. and 402. *Illustration. Price* 6*s. Presented by the Publishers.*

South Australia—Currency. **Gill.**
P.R.G.S. Australasia, South Australian Br. **13** (1912); Supplement, pp. 96.
A brief sketch of the coinage and paper currency of South Australia. Compiled by Thomas Gill. *Facsimiles and Illustrations.*

South Australia—Historical. ——
P.R.G.S. Australasia, South Australian Br. **12**, 1910–11 (1912): 25–35.
Meeting between Captain Flinders and Captain Baudin at Encounter bay.

Southern Ocean—Kerguelen. **Rallier du Baty.**
Ann. I. Océanogr. Paris **3** (1911): Fasc. 3, pp. 48.
Quinze mois aux îles Kerguelen. Par Rallier du Baty. *Sketch-maps and Illustrations.*

New Guinea, Dutch. **Lorentz.**
Zwarte Menschen; Witte Bergen. Verhaal van den tocht naar het Sneeuwgebergte van Nieuw-Guinea. Door H. A. Lorentz. Leyden: E. J. Brill, 1913. Size 10½ × 7½, pp. xii. and 262. *Maps and Illustrations. Presented by the Author.*

Western Australia. *Scottish G. Mag.* **29** (1913): 57–67. **Moore.**

Ahead of civilisation: some aspects of pioneer work in a new state. By Lieut.-Col. Hon. Sir Newton J. Moore. *Illustrations.*

POLAR REGIONS.

Greenland—Eskimo. **Thalbitzer.**

Grønlandske sagn om Eskimoernes fortid. Et bidrag til Arktisk sagnforschung. Af William Thalbitzer. Stockholm: Cederquist, 1913. Size 9½ × 6½, pp. 96. *Illustrations. Price kr.2. Presented by the Publisher.*

Polar Regions. **Nordenskjöld.**

Otto Nordenskjöld. Le monde polaire. Paris: Armand Colin, 1913. Size 7½ × 5, pp. xii. and 324. *Sketch-maps and Illustrations. Price 5 fr. Presented by the Publisher.*

The German edition was reviewed in vol. **36**, p. 214. This French translation, by MM. Parmentier and Zimmermann, has a preface by Dr. Charcot.

MATHEMATICAL GEOGRAPHY.

Astronomical Geography. **Höfter.**

Didaktik der Himmelskunde und der astronomischen Geographie. Verfasst von Dr. Alois Höfter. Leipzig, etc.: B. G. Teubner, 1913. Size 10 × 6, pp. xii. and 414. *Charts, Illustrations, and Diagrams. Price M.11. Presented by the Publisher.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Earth-history. **Swaine.**

The Earth: its genesis and evolution considered in the light of the most recent scientific research. By A. T. Swaine. London: C. Griffin & Co., 1913. Size 9 × 5½, pp. xx. and 278. *Sections and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

Geophysics. *P.R.A. Amsterdam* **14** (1911–12): 211–221. **Zwiers.**

Preliminary investigation into the motion of the pole of the Earth in 1907. By H. J. Zwiers. *Diagram.*

Geophysics—Heat. *Iz. Imp. Russ. G.S.* **48** (1912): 189–223. **Yachevski.**

Materials on geothermics. Edited by L. Yachevski. *Illustrations.* [In Russian.]

Hydrology. *Cairo Sc. J.* **6** (1912): 279–284. **Craig.**

On the accuracy of stream measurement. By J. I. Craig. *Diagram.*

Meteorology. **Exner and Trabert.**

Encyklopädie der mathematischen Wissenschaften (Leipzig, 1905 . . .). Bd. vi., 1. B (Herausgegeben von Ph. Furtwängler u. a.), pp. 179–234. Dynamische Meteorologie. Von Felix M. Exner und W. Trabert.

Meteorology—Atmosphere. **Sandström.**

B. Mount Weather Observatory **5** (1912): 83–131.

Atmospheric studies. By J. W. Sandström. *Illustration and Diagrams.*

One section treats of air movements in the mountains of Sweden, the rest is rather concerned with general principles.

Meteorology—Föhn. **Ficker.**

Sitzb. K.A.W. Wien, Math.-Naturw. Kl., Abt. IIa., **121** (1912): 829–874.

Föhnuntersuchungen im Ballon. Von Dr. H. v. Ficker. *Diagrams.*

Meteorology—Instruments. **Meteorological Office.**

A barometer manual for the use of seamen; a text-book of marine meteorology with an appendix on the Thermometer, Hygrometer, and Hydrometer. Issued by the authority of the Meteorological Committee. 7th edit. London: Wyman & Sons, 1912. Size 9½ × 6, pp. 84. *Charts, Diagrams, and Illustrations. Price 6d.*

Oceanography. *Smithsonian Misc. Coll.* **60** (1912): No. 13, pp. 34. **Clark.**

A study of the salinity of the surface water in the North Pacific Ocean and in the adjacent enclosed seas. By Austin Hobart Clark.

See notice in the April number, p. 379.

Oceanography—Atlantic—Plankton. **Mangin.**
Ann. I. Océanogr. Paris **4** (1912): Fasc. 1, pp. 66.
Phytoplancton de l'Atlantique. Croisière du René (Septembre 1908). Par L. Mangin. *Map and Illustrations.*

Oceanography—Charts. *Ann. I. Océanogr. Paris* **3** (1911): Fasc. 2, pp. 9–14. **Thoulet.**
Densité de sondages et veracité des cartes bathymétriques sous-marines. Par J. Thoulet. *Maps.*

Oceanography—Deposits. *Ann. I. Océanogr. Paris* **3** (1912): Fasc. 7, pp. 42. **Thoulet.**
Mémoires de lithologie marine. Par J. Thoulet. (1, Considérations sur l'usure mécanique des grains de sable. 2, Considérations sur les deltas. 3, De la progression et de la distribution des sédiments marins le long des côtes. 4, Considérations sur la chute verticale des sédiments marins.)

Oceanography—Icebergs. *Science* **90** (1913): 513–515. **Aitken.**
The influence of icebergs on the temperature of the sea. By John Aitken. *Diagram.*

Oceanography—Mediterranean. **Manuelli and Sella.**
B.R. Com. Talassografico Italiano, 1912: 233–237.
Prima crociera nel mare di Libia (marzo-aprile, 1912). [Di Antonio Manuelli e Massimo Sella.]

Sedimentation. *Ann. I. Océanogr. Paris* **4** (1912): Fasc. 4, pp. 68. **Sudry.**
Expériences sur la puissance de transport des courants d'eau et des courants d'air et remarques sur le mode de formation des roches sédimentaires détritiques et des dépôts éoliens. Par L. Sudry. *Diagrams.*

Seismology. *B. Seismological S. America* **2** (1912): 233–242. **McAdie.**
Taal, Asama-Yama and Katmai. By A. G. McAdie. *Illustrations.*

Seismology. *P.R. Philosoph. S. Glasgow* **43** (1911–12): 97–103. **Ross.**
On a further relation between Seismic frequency and the motion of the Earth's pole. By Dr. Alexander D. Ross and John J. Ross.

Tidal observation. *Ann. Hydrographiques* (2 Sér.) **30** (1908–10): 383–521. **Favé.**
Marégraphe plongeur. Appareil enregistrant les marées sur les côtes et au large. Par M. L. Favé. *Illustrations and Diagrams.*

Tides. *C.R.A. Sc. Paris* **156** (1913): 211–213. **Fichot.**
Sur la production des marées statiques de la deuxième sorte dans un océan répondant à une loi quelconque de profondeur. Par E. Fichot.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. *B.G.S. Philadelphia* **11** (1913): 63–102. **Davis.**
Human response to geographical environment. By [Prof.] W. M. Davis. *Illustrations.*

Anthropogeography—Culture. **Wilke.**
Kulturbeziehungen zwischen Indien, Orient und Europa. Von Dr. Georg Wilke. (Mannus-Bibliothek, herausgegeben von Prof. Dr. Gustaf Kossinna; Nr. 10.) Würzburg; Curt Kalitzsch, 1913. Size 10½ × 7½, pp. iv. and 276. *Illustrations. Price M.*12. *Presented by the Publisher.*

Anthropogeography—Jews. **Hersch.**
Le Juif errant d'aujourdhui. Etude sur l'émigration des Israélites de l'Europe oriental aux Etats-Unis de l'Amérique du Nord. Par L. Hersch. Paris: M. Giard et E. Brière, 1913. Size 9 × 5½, pp. 332. *Price 6 fr. Presented by the Publishers.*

Colonization. *B. American G.S.* **45** (1913): 255–275. **Semple.**
Japanese Colonial Methods. By Ellen Churchill Semple.

Commercial. **Andree.**
Karl Andrees Geographie des Welthandels, vollständig neu bearbeitet . . . und herausgegeben von Dr. Franz Heiderich und Dr. Robert Sieger. 3 Band. Frankfurt a. M.: Heinrich Keller, 1913. Size 10 × 7, pp. x. and 572. *Maps. Price 9s. 6d.*

Commercial—Petroleum. **Redwood.**

Petroleum: a treatise on the geographical distribution and geological occurrence of petroleum and natural gas; the physical and chemical properties, production, and refining of petroleum and ozokerite; the characters and uses, testing, transport, and storage of petroleum products; and the legislative enactments relating thereto; together with a description of the shale oil and allied industries; and a full bibliography. By Sir Boverton Redwood. 3rd edit. 3 vols. London: C. Griffin & Co., 1913. Size 9 × 6, pp. (vol. 1) xxxii. and 368; (vol. 2) 418; (vol. 3) 384. *Maps, Illustrations, and Diagrams. Price 50s. net. Presented by the Publishers.*

Commercial—Shipping. **"The Times."**

The Times Shipping Number; reprinted from *The Times*, Friday, December 13, 1912. London: J. P. Bland, 1913. Size 11½ × 8½, pp. xiii. and 286. *Map. Price 6s. net. Presented by the Publishers.*

Commercial—Text-book. **Howarth.**

The Oxford Geographies; edited by A. J. Herbertson. A commercial geography of the world. By O. J. R. Howarth. Oxford: Clarendon Press, 1913. Size 7½ × 5, pp. 326. *Sketch-maps. Price 2s. 6d. net. Presented by the Publishers.*

Ethnology. **Hutchinson.**

Customs of the World: a popular account of the manners, rites, and ceremonies of men and women in all countries. Edited by Walter Hutchinson. Vol. 1. London: Hutchinson & Co., [1913]. Size 11 × 8½, pp. xxiv. and 584. *Sketch-maps and Illustrations. Price 13s. 6d. net. Presented by the Publishers.*

Political Geography. **Long.**

The framework of Union; a comparison of some Union constitutions. With a sketch of the development of union in Canada, Australia, and Germany; and the text of the Constitutions of the United States, Canada, Germany, Switzerland, and Australia. [By B. K. Long.] Prepared for and issued by the Closer Union Society. Cape Town: Cape Times, Ltd., 1908. Size 10 × 6, pp. viii., 208, and cxviii.

BIOGRAPHY.

Livingstone. **Fraser.**

Livingstone and Newstead. By A. Z. Fraser (Alice Spinner). London: John Murray, 1913. Size 9 × 5½, pp. xv. and 263. *Portraits and Illustrations. Price 10s. 6d. net. Presented by the Publisher.*

Livingstone. *Scottish G. Mag.* 29 (1913): 252–256. **Johnston.**

David Livingstone and his Work in Africa. By Sir Harry Johnston.

Livingstone. *Scottish G. Mag.* 29 (1913): 242–252. **Galt.**

The Livingstone Centenary Loan Exhibition at the Royal Scottish Museum. By Alexander Galt. *Illustrations.*

Livingstone. *Scottish G. Mag.* 29 (1913): 225–242. **Gregory.**

Livingstone as an Explorer: An Appreciation. By J. W. Gregory. *Maps.*

Scott. *Scottish G. Mag.* 29 (1913): 148–153. **Bruce.**

The late Captain Robert Falcon Scott. An appreciation. By Dr. William S. Bruce. *Portrait.*

Williams. **Williams.**

How I became a Governor. By Sir Ralph Williams. London: John Murray, 1913. Size 9 × 5½, pp. xxiv. and 466. *Sketch-map and Illustrations. Price 15s. net. Presented by the Publisher.*

GENERAL.

Education—Text-book. **Munro.**

A text-book of geography, practical and physical. By Ronald M. Munro. Edinburgh: John Cormack, [1913]. Size 7½ × 5, pp. 480. *Sketch-map, Illustrations, and Diagrams. Presented by the Publisher.*

Travel. **Reynolds-Ball.**

Bradshaw's through routes to the chief cities and bathing and health resorts of the world. Edited by Eustace Reynolds-Ball. London: H. Blacklock & Co., 1913. Size 6½ × 4½, pp. lxviii. and 701. *Maps and Plans. Price 6s. net. Presented by the Publishers.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

British Isles. **Bartholomew.**

Bartholomew's Contour Motoring Map of the British Isles showing the best touring roads, with heights and distances. Reduced by permission for the Ordnance Survey. Scale 1: 1,000,000 or 1 inch to 15·9 stat. miles. Edinburgh: John Bartholomew & Co., [1913]. *Price 5s. net. Presented by the Publishers.*

A general map showing relief by means of tints in brown, roads in red, with heights and distances. By the manner in which the road is drawn its special character can be seen at once. Insets on enlarged scales are given of the environs of London, Edinburgh, Dublin, Manchester, and Glasgow.

British Isles—England and Wales. **Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, from June 1 to 30, 1913.

England and Wales :—

Hampshire, County Diagram. Scale 4 miles to 1 inch, showing Civil Parishes, with a Table of the Areas. *Price 6d.*

1-inch map.

Large Sheet series; printed in colours and folded in cover or flat in sheets. Special Map of Pwllheli and Criccieth District. *Price on paper*, 1*s.* 6*d.*; *mounted on linen*, 2*s.*; *mounted in sections*, 2*s.* 6*d.*

NOTE.—The combined Map of Pwllheli comprising Sheets 117, 133, 134, and parts of sheet 118 published on March 7, 1907, is identical with sheet 49 of the Large Sheet series, and will in future be issued as such.

6-inch Scale :—

Revised. Quarter-sheets, with contours in blue or red. *Price* 1*s. each.*

Berkshire, 4 sheets. **Cheshire**, 3 sheets. **Lancashire**, 1 sheet. **Sussex**, 1 sheet. **Yorkshire**, 1 sheet.

1 : 2500 scale. *Price* 3*s. each* :—

Carnarvonshire, 2 sheets. **Denbighshire**, 8 sheets. **Flintshire**, 3 sheets. **Lancashire**, 15 sheets. **Middlesex**, 4 sheets. **Norfolk**, 1 sheet. **Oxfordshire**, 15 sheets. **Surrey**, 15 sheets. **Yorkshire**, 15 sheets.

NOTE.—There are no coloured editions of these sheets, and the unrevised impressions have been withdrawn from sale.

(*E. Stanford, Ltd., London Agents.*)

British Isles—England. **Gross.**

The *Daily Telegraph* Road maps with Contours. By Alexander Gross, F.R.G.S., First Series: 1, London to Brighton; 2, London to Eastbourne; 3, London to Folkstone; 4, London to Hastings; 5, London to Margate; 6, London to Portsmouth and Southsea. London: "Geographia," Ltd., 1913. *Price* 1*s. net. Presented by the Publishers.*

A set of six diagrams, rather than maps, not drawn to scale, nor properly orientated; but showing in a broad red line, on separate cards, the roads from London to Brighton, Eastbourne, Folkestone, Hastings, Margate and Portsmouth, and Southsea, with the names of places passed through, and distances. A vertical section to show the steepness of the gradient is given along one side of the road, and descriptive letterpress with information useful to motorists on the other.

British Isles—London. **Philip.**

Sectional card-map of London. Scale 1: 31,680 or 2 inches to 1 stat. mile. London: George Philip & Son, Ltd., [1913]. *Price 7d. net. Presented by the Publishers.*

A plan of London on 16 cards printed on both sides. Each card measures 6 by 3½ inches, and the whole fit into a small paper envelope or cover, convenient for pocket use.

British Isles—Wales. **Lewis.**

Bacon's New Contour Map of Wales. [In Welsh.] Scale 1 : 278,784 or 1 inch to 4·4 stat. miles. Edited by Prof. Timothy Lewis, M.A. London: G. W. Bacon

& Co., Ltd., [1913]. *Price, mounted on rollers and varnished, 7s. 6d. Presented by the Publishers.*

The relief is indicated on the layer system in shades of green and reddish-brown. Names are in Welsh, and in the forms of spelling Prof. Lewis has consulted the best authorities. The map is executed in a bold style, and is suitable for use in class rooms.

Bulgaria. **Peucker.**

Königreich Bulgarien und die Zentralen Balkanländer zwischen Adria und Pontus. Maszstab 1 : 864,000 (1 inch to 13·6 stat. miles). III. Auflage. Aussere Grenzen nach dem Londoner Präliminarfrieden innere Grenzansprüche Juni 1913. Nach original-materialien zusammengestelt von Dr. K. Peucker. Vienna: Artaria & Co., 1913. *Price 3K. Presented by the Publishers.*

Central Europe. **Freytag.**

G. Freytag's Automobil- und Radfahrer-Karten. Scale 1 : 300,000 or 1 inch to 4·7 stat. miles. Sheet 7, Münster. Vienna; G. Freytag & Berndt, [1913]. *Presented by the Publishers.*

France. **L'Aéro Club de France.**

Carte de l'Aéro Club de France. Publiée sous le haut patronage et avec le concours du Ministère des Travaux Publics. Scale 1 : 200,000 or 1 inch to 3·2 stat. miles. Sheets: Nancy, Troyes, Verdun. Paris: E. Blondel la Rougery, [1913].

Iceland. **Generalstabens Topografiske Afdeling, Copenhagen.**

Generalstabens Topografiske Kort over Island. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheets: 5 N.A. Snæfellsjökull; 14 S.A., S.V., Breidifjördur; 15 N.A., N.V., Snæfellsnes; 25 N.V., S.A., S.V., Hnappadalur; 26 N.A., N.V., Borgarfjördur; 35 S.A., Nordurardalur; 36 N.A., N.V., Botnsheida. Copenhagen: Generalstabens Topografiske Afdeling, 1911. *Presented by the Chief of the Danish General Staff.*

This new survey of Iceland was noticed in the *Geographical Journal* for June, 1906. The present sheets are from the work of 1910, and, like those previously published, they are excellent productions. Relief is shown by contour-lines at intervals of 20 metres, on the land in brown and on the ice in blue.

ASIA.

China. **Tafel.**

Dr. Albert Tafel: Reise in China und Tibet, 1905–1908. Kartographische Ergebnisse, Teil 1: China. 31 Karten im Maszstabe 1 : 200,000 (1 inch to 3·2 stat. miles). Herausgegeben von der Gesellschaft für Erdkunde zu Berlin. Berlin: E. S. Mittler & Sohn, 1912. *Presented by the Gesellschaft für Erdkunde zu Berlin.*

A special notice of this will appear later.

AFRICA.

Egypt. **Egyptian Survey Department.**

Topographical map of Egypt. Scale 1 : 10,000 or 6·3 inches to 1 stat. mile. Sheets: N.W., 17–4, 18–4, 19–5, 21–5, 22–5, 25–16, 25–19, 27–17, 28–11, 28–12, 28–13, 28–14, 28–15, 28–19, 28–20, 29–12, 29–14, 29–15, 29–19, 30–14, 30–19, 31–10, 31–11, 31–18, 31–19, 31–20, 32–11, 32–14, 32–19, 32–20, 33–11, 33–13, 34–11, 36–12, Mudiria Beheira. Giza: Survey Department, 1913. *Presented by the Director-General, Egyptian Survey Department.*

Egyptian Sudan. **Survey Office, Khartum.**

Anglo-Egyptiah Sudan. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets: 54–D, Um Soneita; 54–G, Um Badr; 54–H, Gebel Katul; 55–A, El Safia; 55–E, Kagmar. Khartum: Survey Office, 1913. *Price 10 P.T. each sheet. Presented by the Director of Surveys, Sudan Government.*

Nigeria, Southern. **Guggisberg.**

Southern Nigeria. Scale 1 : 125,000 or 1 inch to 1·9 stat. miles. Provisional series. Sheet: North C 31–U II., Shaki West. Published by authority of Sir Frederick Lugard, G.C.M.G., C.B., D.S.O., Governor, under the direction of Major F. G. Guggisberg, C.M.G., R.E., Director of Surveys, Southern Nigeria, and Captain R. H. Rowe, R.A., Deputy-Director, Topographical Branch. Revised to March, 1913. Printed by Messrs. W. & A. K. Johnston, Ltd., Edinburgh and London. *Price 1s. 6d. each sheet. Presented by Messrs. W. & A. K. Johnston.*

AMERICA.

Canada. **Dept. of the Interior, Ottawa.**

Northern Alberta. Scale 1:792,000 or 1 inch to 12·5 stat. miles. Map showing disposition of lands. Prepared under the direction of F. C. C. Lynch, Superintendent of Railway Lands. Corrected to January 1, 1913. Ottawa: Department of the Interior, 1913. *Presented by the Dept. of the Interior, Railway Lands Branch, Ottawa.*

Canada. **Dept. of the Interior, Ottawa.**

Sectional Map of Canada. Scale 1: 190,080 or 1 inch to 3 stat. miles. Sheets: 24, Lake of the Woods, revised to March 7, 1912; 74, Cross lake, revised to February 18, 1913; 214, Rocky Mountains House, revised to March 14, 1913; 414, Saulteux, revised to April 15, 1913; 415, Tawatinaw, revised to February 26, 1913; 463, Smoky river, revised to March 13, 1913. Ottawa: Department of the Interior, Topographical Surveys Branch, 1913. *Presented by the Department of the Interior, Ottawa.*

Canada. **Dept. of Militia and Defence, Ottawa.**

Topographic map of Canada. Scale 1: 63,360 or 1 inch to 1 stat. mile. Sheets: 37, St. Thomas, Ontario; 38, Strathroy, Ontario; 41, Wallaceburg, Ontario. Published by the Geographical Section, General Staff, War Office, [1913]. London agents: E. Stanford, Ltd.; Sifton Praed & Co.; T. Fisher Unwin. *Price 2s. each sheet. Presented by the Director of Military Operations.*

Canada. **Geological Survey, Ottawa.**

Geological Survey of Canada. Scale 1: 253,440 or 1 inch to 4 stat. miles. Sheet 121, Grenville, Quebec and Ontario.—Map 30 A, Mother Lode and Sunset Mines, Deadwood, British Columbia. Economic Geology. Scale 1: 4800 or 13·2 inches to 1 stat mile.—Map 52 A, North-east part of the Serpentine Belt, Eastern Townships, Quebec. Economic Geology. Scale 1: 253,440 or 1 inch to 4 stat. miles. Ottawa: Department of Mines, Geological Survey, 1911–12. *Presented by the Department of Mines, Geological Survey, Ottawa.*

Canada—British Columbia. **Department of Lands, B.C.**

British Columbia. Scale 1: 1,125,000 or 1 inch to 17·75 stat. miles. 4 sheets. Victoria, B.C.: Department of Lands, 1912. *Presented by the Minister, Department of Lands, British Columbia.*

A preliminary issue of this map was noticed in the *Geographical Journal* for May, 1913. This is the finished map, and will doubtless be of considerable service for general reference. No attempt has been made to show mountains, although the names of important peaks and passes are given, with the heights in figures.

United States. **Rand, McNally & Co.**

Rand-McNally Indexed County and Railroad Pocket Maps: California, scale 1: 1,140,480 or 1 inch to 18 stat. miles; Montana, scale 1: 1,457,280 or 1 inch to 23 stat. miles; Oklahoma, scale 1: 823,680 or 1 inch to 13 stat. miles; Texas, scale 1: 1,267,200 or 1 inch to 20 stat. miles. Chicago and New York: Rand, McNally & Co., 1913. *Price 1s. 6d. each.*

United States. **U.S. Geological Survey.**

Geologic Atlas of the United States. Folios: 183, Llano-Burnet, Texas; 184, Kenova, Kentucky—West Virginia—Ohio. Washington: Dept. of the Interior, U.S. Geological Survey, 1912. *Presented by the U.S Geological Survey.*

GENERAL.

German Colonies. **Sprigade & Moisel.**

Deutscher Kolonialatlas mit illustriertem Jahrbuch. Auf Veranlassung der Deutschen Kolonialgesellschaft herausgegeben. Bearbeitet von P. Sprigade und M. Moisel. Ausgabe, 1913. Berlin: Dietrich Reimer (Ernst Vohsen), 1913. *Price 80 Pf. Presented by the Publishers.*

This is the seventeenth year of issue of this useful little atlas giving full information connected with German colonies. It contains eight maps showing general features and boundaries, and dealing specially with means of communication. Preceding the maps are forty-four pages of text, with illustrations from photographs, giving statistical details concerning trade and other subjects.

World. **Monaco.**

Carte générale bathymetrique des Océans. Publiée par le Cabinet Scientifique de S.A.S. le Prince de Monaco. Scale 1 : 10,000,000 or 1 inch to 157·8 stat. miles. Sheets A III. and A IV. Paris, 1912. *Presented by the Cabinet Scientifique de S.H.S. le Prince de Monaco, Paris.*

Two sheets of a new edition of this well-known map. Together they embrace the region from the equator to 46° 40′ N. lat., and from the meridian of Greenwich eastward to 180° longitude, and thus include the Mediterranean, the northern part of the Indian ocean, and the western Pacific. A comparison of this edition with the first published eight years ago will show considerable alterations and improvements, of which the most striking is the indicating of the land relief by contour and tints of brown. As regards the oceans, new soundings have been added, and the contour-lines showing the depths of water greatly changed in many places owing to more recent information. A complete list of the authorities made use of is given at the bottom of each sheet.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, from June 1 to 28, 1913. *Presented by the Hydrographer, Admiralty.*

New Charts—No. W. Outline of the World on Mercator's projection, 1*s.* 2, The British islands, 3*s.* 2339, The North sea, 3*s.* **New Editions of Charts**—2460, North-west Pacific ocean: Kamchatka to Kadiak island, including Bering sea and strait, 3*s.* 789, South Pacific ocean comprised between the parallels of 27° south and 60° south, and extending from Melbourne to Cape Horn—eastern sheet, 3*s.* 2675*a* English channel—western sheet: Milford haven to Plymouth, 4*s.* 2675*b*, English channel—middle sheet: Plymouth to Portsmouth, 4*s.* 2631, England, south coast: Portsmouth harbour, 5*s.* 1407, Scotland, east coast: St. Abb's head to Aberdeen, 3*s.* 1190, England, east coast: Blakeney to Flamborough head, 5*s.* 46, Ireland, north coast: Larne to Bloody Foreland (Plan: The Maidens), 3*s.* 2148, France, north coast: Cayeux to Boulogne, 3*s.* 1228, Africa, west coast: Cape Spartel to Cape Ghîr (Plans of El Araish and Rabat and Sali, on this sheet erased), 3*s.* 1174, Africa, west coast: Bonny, New Calabar and Sombrero rivers, 2*s.* 632, Africa, west coast: Walfisch bay to Orange river (Plans: Spencer bay, Hottentot bay, Ichabo, Angra Pequeña (Lüderitz bay), Possession road, Prince of Wales bay (Plan of Port D'Ilheo on this sheet erased), 3*s.* 841, Bay of Bengal, Nicobar islands: Nancowry harbour, 2*s.* 998, Gulf of Siam: Pulo Kapas to Lakon roads (Plans: Singora roads, Patani roads, Great Redang harbour, Tringano; Plan of Entrance to Kelantan river on this sheet erased), 3*s.* 2657, Japan, Nipon: Gulf of Tokyo or Yedo, 3*s.* 139, Japan, Kiusiu: Ikitsuki jima to Taka shima, including the northern approaches to Hirado kaikyo, 3*s.* 1700, Australia, west coast: Freemantle harbour and Gage roads, 3*s.* 1069, Australia, east coast: Port Jackson (Plan: North and Middle harbours), 5*s.* 1423, New Zealand, North island: Port Nicholson, 3*s.* 803, New Zealand, North island: Lambton harbour and Evans bay, 3*s.* 2591, New Zealand: River Waiau to Cape Foulwind (Plan Greymouth harbour), 3*s.* 451, West Indies (Plans on the north coast of Jamaica): Falmouth harbour, Annatto bay, St. Ann bay, Port Antonio, Ocho Rios bay, 2*s.* 1651, North America, east coast: Nova Scotia, Prince Edward island, and part of New Brunswick (Plan added: Sable island), 4*s.* 2516, North America, east coast: Gulf of St. Lawrence and the river to Quebec, 3*s.*

(*J. D. Potter, Agent.*)

Atlantic, North. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, June, 1913. Washington: U.S. Hydrographic Office, 1913. *Presented by the U.S. Hydrographic Office.*

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly Meteorological charts of the North Atlantic and Mediterranean, June and July, 1913. London: Meteorological Office, 1913. *Price 6d. each. Presented by the Meteorological Office.*

Indian Ocean. **Meteorological Office.**

Monthly meteorological charts of the Indian Ocean, June and July 1913. London: Meteorological Office, 1913. *Price 6d. each. Presented by the Meteorological Office.*

Indian Ocean. **U.S. Hydrographic Office.**

Pilot chart of the Indian Ocean, July and August, 1913. Washington: U.S. Hydrographic Office, 1913. *Presented by the U.S. Hydrographic Office.*

Pacific, North. **U.S. Hydrographic Office.**

Pilot charts of the North Pacific Ocean, July and August, 1913. Washington: U.S. Hydrographic Office, 1913. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

East African Protectorate. **Dracopoli.**

Fifty-one photographs taken during a journey from Kismayu to the Lorian Swamp, East Africa Protectorate, by I. N. Dracopoli, Esq. *Presented by I. N. Dracopoli, Esq.*

A set of enlargements from photographs taken during the interesting journey described by Mr. Dracopoli in the present number of the *Geographical Journal*. They are of special importance, as much of the country traversed was previously unexplored.

(1) View of Lamu; (2) Kismayu; (3) Street scene, Kismayu; (4) Somali dancer, Kismayu; (5) Arabs, Kismayu; (6) Arab chiefs, Kismayu; (7) Tropical vegetation near the coast; (8) Dibayu plain; (9) Eylad waterhole; (10) Lâk Guran at Chimbirlé; (11) Forest country in Guranlagga; (12) A small waterhole in Jore; (13) Open glade surrounded by bush, Jore; (14) Gama gar swamp; (15) Native cattle, Gulola; (16) Bush country in Arroga; (17) Rainpool at Roblé; (18) Old Galla trail near Roblé; (19) Desert scrub near Liboyi; (20) Desert scrub near the Lak Dera; (21) Waterhole at Chimbirlé near Lak Dera; (22) Native cattle coming down to drink at Haryel; (23) "Waja" trees, Lorian swamp; (24) The river as it emerges from the eastern end of the main Lorian swamp; (25) The second Lorian swamp; (26 and 27) Camels coming through the bush, Western Uaso Nyiro; (28 and 29) River Uaso Nyiro near Marti; (30) River Uaso Nyiro 50 miles above Marti; (31) Theodolite observation on edge of Marti plateau; (32) Typical view of East African desert country; (33) A Somali guide; (34) A Mohammed Zubheir Somali warrior; (35) A Jubaland Somali, Herti tribe; (36) Spectators watching a dance; (37) Somali warriors; (38) Loading a camel; (39) Camels resting; (40) Filling up the water-bottles at a small rainpool in the bush; (41) Somali huts; (42) *Euphorbia candelabria*; (43) Grevy's zebra; (44) Hunter's hartebeeste; (45) Vultures; (46) Tame serval cat; (47) Anthill; (48) A bush path in Kurde; (49 and 50) Ancient ruins near Gondal; (51) Somali huts.

Egypt. **Murray.**

Thirty-two photographs of Egypt, taken by George W. Murray, Esq. *Presented by George W. Murray, Esq.*

Mr. Murray has for some years past been connected with the Egyptian Government Survey, and during his duties has had occasion to travel somewhat extensively in the country. He has made good use of his opportunities for photographing, and the following set forms a welcome addition to our collection.

(1) Boy, Aleigi tribe, Sinai; (2) Suleiman Ghoneim, Sheikh of the Awarma tribe, Sinai; (3) Beduin boys, Sinai; (4 and 6) Camels, Wadi Abu Demât, Sinai; (5) Baby camel, Wadi Abu Demât; (7) Gebel Adeidia and Wadi Shellal, Sinai; (8) Sheikh Hashash's tomb, Wadi Shellal; (9) Camels, Fayun; (10) Rock in Wadi Hamr, Sinai; (11) Wadi Baba, Sinai; (12 and 13) Wadi Abu Hamât, Sinai; (14) Turquoise mines in Wadi Maghara, Sinai; (15) Wadi Shellal; (16) Gebel Umm Sakran, Sinai; (17) Gebel Umm Riglein, Sinai; (18) Wadi Igna, Sinai; (19) Gebel Abu Alaga, Sinai; (20) Wadi Kabbash, Eastern Desert; (21 and 22) Umm Huetat, Eastern Desert; (23) Bir Umm Dalfa, Eastern Desert; (24) Gebel Abu Zugata, Eastern Desert; (25) Gebel Shayeb from summit of Gebel el Oman, Eastern Desert; (26) Summit of Gebel el Oman; (27 and 30) Nile boat; (28) Delta barrage; (29) Esna barrage; (31) Ramlet el Angeb; (32) Broken regulator, Delta barrage.

N.B.—It would greatly add to the value of the collection of Photographs which have been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

BOLIVIA-BRAZIL BOUNDARY, 1911-12.

LIST OF POSITIONS.

R. ACRE.

Station.	Latitude S.	Longitude W. of Greenwich.	Method of determination of Longitude.	Authority.
Empreza	9° 58′ 32″	67° 52′ 51″	Chronometric	Bolivian and Brazilian Joint Commissions.
Capatara	10 15 48·57	67 53 46·8	Occultations	Ditto ditto
Iracema	10 31 36·18	68 13 24·76	Chronometric	Bolivian Survey Commission.
Boca del Lago	10 36 26·41	68 20 18·02	,,	,, ,,
Nova Aurora	10 37 43·69	68 28 50·43	,,	,, ,,
Cobija	11 01 02·85	68 50 23·90	Occultations	Joint Commissions
Permanent Mark "Bolivia"	11 01 04·63	68 50 14·7	,,	,, ,,
Permanent Mark "Brazil"	11 01 01·24	68 50 15·76	,,	,, ,,
Belmonte	10 59 52·37	68 53 15·61	Chronometric	Latitude by Joint Commissions. Longitude by Bolivian Commission.
Sta Cruz	11 01 18·84	68 59 33·24	,,	,,
Montevideo	10 59 41·75	69 05 36·01	,,	,,
Plauhy	10 57 37·73	69 13 56·02	,,	,,
Sta Guiteria	10 56 10·94	69 24 18·94	,,	,,
Sacado	10 56 53·27	69 20 57·77	,,	,,
Acarahu	10 56 22·71	69 26 09·37	,,	,,
San Pedro	10 56 0·357	69 31 03·58	,,	,,
San Miguel	10 57 19	69 33 39·56	,,	,,
Frontera	10 57 07·36	69 36 35·72	,,	,,
Tacna	10 56 44·8	69 39 09·43	,,	Joint Commissions.
Permanent Mark "Bolivia"	10 56 38·73	69 39 09·31	,,	Joint Commissions.
Permanent Mark "Brazil"	10 56 33·20	69 38 58·41	,,	,,

R. RAPIRRAN.

A.	10° 31′ 04″·10	67° 40′ 07″·35	Occultations.	Bolivian and Brazilian Joint Commissions.
B.	10 32 37·46	67 41 37·95	Theodolite Traverse.	,,
C.	10 34 12·93	67 42 47·10	,,	,,
D.	10 35 22·31	67 43 22·20	,,	,,
E.	10 36 50·54	67 44 51·30	,,	,,
Permanent Boundary Mark Ojos del Rapirran Principal Source	10 36 13·01	67 45 42·63	,,	,,

R. IQUIRY.

A.	10° 24′ 41″·05	67° 47′ 35″·33	Chronometric	Bolivian and Brazilian Joint Commissions.
Pulmares Principal Source	10 25 22·37	67 50 06·83	,,	,,

ARROYO BAHIA.

Permanent Boundary Mark on left bank at mouth	11 01′ 04″·63	68° 50′ 14″·7	Occultations.	Bolivian and Brazilian Joint Commissions.
Source	11 08 43·84	68 47 40·29	,,	Latitude by Joint Commissions. Longitude by Bolivian Commission.
Station on Floresta branch	11 08 49·68	68 51 37·35	,,	Bolivian Commission.

R. XIPAMANU.

Confluence with R. Karamanu	11′ 42′ 30″	67° 47′ 36″	Chronometric.	Bolivian Survey Commission.
Maloca (barraca)	10 39 49 96	67 53 20	,,	,,
Alto Xipamanu (barraca)	10 42 53·98	68 10 34	,,	,,
Confluence of Rs. Ina and Xipamanu	10 42 57	68 10 45	,,	,,
Adelia (barraca)	11 00 54·49	68 23 52	,,	Latitude Joint Commissions. Longitude Bolivian Commission.
José Avelino (Sources)	11 05 59·76	68 37 15	,,	,,

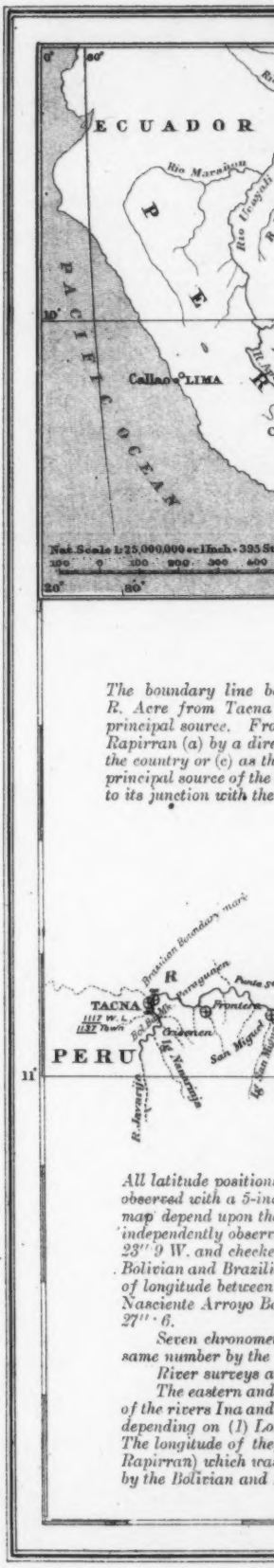
R. INA.

Camp at José Madeira (barraca)	10° 41′ 42″·6	68 22′ 13″	Chronometric.	Bolivian Survey Commission.
Francisco Duarte (barraca)	10 42 14·14	68 25 14	,,	,,
Puente Nova Aurora (barraca)	10 47 25·74	68 28 55	,,	,,
Chagas (barraca)	10 53 00·4	68 33 05	,,	,,
Ojo del Mundo (barraca)	11 01 18·2	68 36 51	,,	Latitude Joint Commissions. Longitude Bolivian Commission.
Source	11 01 23·41	68 36 32·6	,,	,,

CAMPS, BARRACAS, ETC.

Antoine Felippe (barraca)	10° 41′ 09″·75	67° 48′ 57″	Chronometric.	Bolivian Survey Commission.
Catuaba (barraca)	10 31 40	67 46 09	,,	,,
Igaripe Grande (barraca)	10 42 27·5	68 00 43·5	,,	,,
Escondido (barraca)	10 44 51·8	68 08 01	,,	,,
Centre Virgem (barraca)	10 32 52·9	67 51 55	,,	,,
Alto Alegre (barraca)	10 39 05·61	68 12 31	,,	,,
Muimanu (barraca)	10 53 00·18	68 09 31	,,	,,
Forteleza ,,	10 58 53·01	68 16 47	,,	,,
Passarinho (Igaripe Serpa)	11 06 52·05	68 32 19	,,	Latitude Joint Commissions. Longitude Bolivian Commission
Nascimiento (Source of the R. de Arreias, one of the sources of R. Muimanu)	11 06 58·82	68 30 45	Occultation.	,,
Bizarre (barraca)	10 48 54·9	68 31 48	Chronometric.	,,
Barraca Manaós	11 06 06·25	68 41 17	,,	,,

All Latitudes are the means given by observations of balanced N. and S. stars.
Seven half chronometer watches were carried by the Bolivian Survey Commission.



The boundary line b
R. Acre from Tacna
principal source. Fr
Rapirran (a) by a dir
the country or (c) as th
principal source of the
to its junction with the

All latitude position
observed with a 5-in
map depend upon th
independently observ
23″·9 W. and checke
Bolivian and Brazili
of longitude between
Nasciente Arroyo Ba
27″·6.

Seven chronome
same number by the

River surveys a

The eastern and
of the rivers Ina and
depending on (1) Lo
The longitude of the
Rapirran) which wa
by the Bolivian and

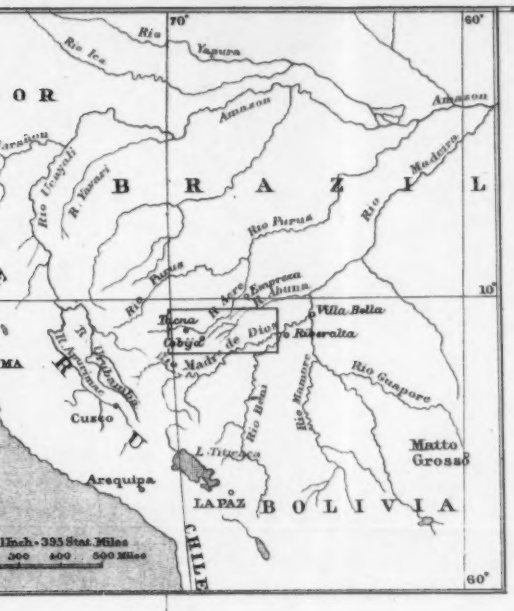
Map of the Region between TACNA and the confluence of the Rivers ABUNA AND RAPIRRAN

Prepared by the Bolivian Survey Commission under the direction of COMMANDER H. A. EDWARDS, R.D., R.N.R. Ret.d 1911 - 12.

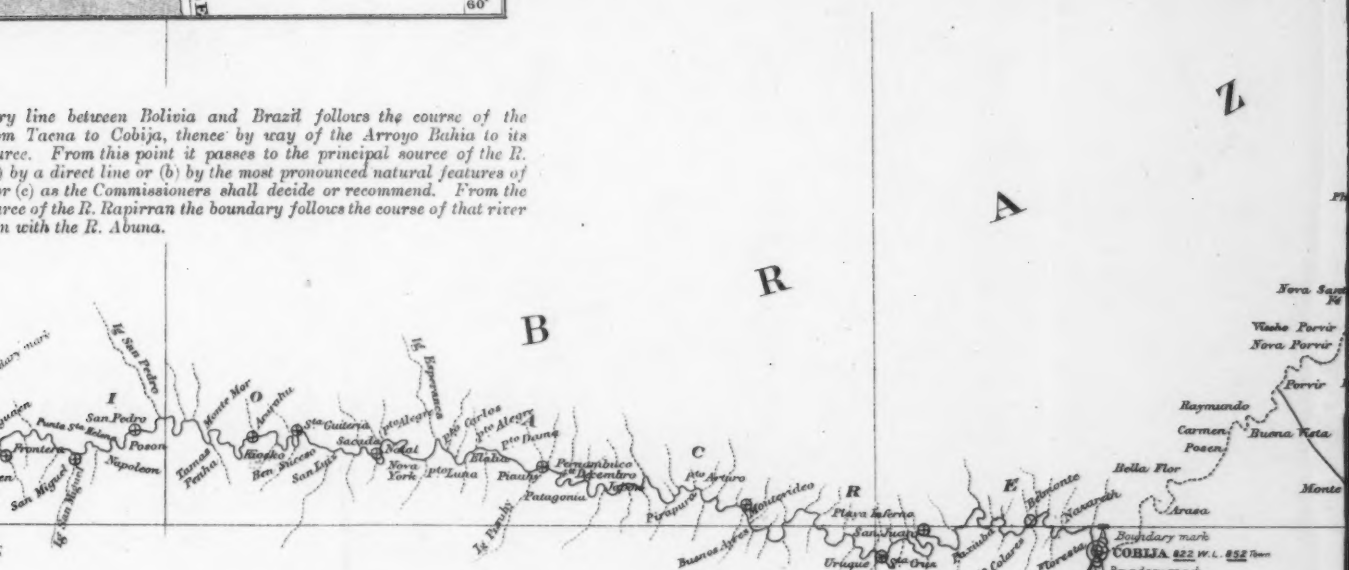
Natural Scale 1: 500,000 or 1 Inch. = 7·89 Stat. Miles.

10 5 0 10 20

- ⊕ .... Latitude by North and South Stars, Longitude by Chronometric Differences
- ⊕ .... Positions where occultations of stars were observed for longitude
- ——— Routes mapped from Prismatic Compass Traverses and adjusted to Astronomically Determined Positions
- ——— Routes travelled by members of commission but not mapped.
- - - - - - Routes from information only.
- ——— Rivers followed and surveyed by members of the Commission.
- ------ Approximate course of rivers, unmapped.



ry line between Bolivia and Brazil follows the course of the
m Tacna to Cobija, thence by way of the Arroyo Bahia to its
urce. From this point it passes to the principal source of the R.
) by a direct line or (b) by the most pronounced natural features of
r (c) as the Commissioners shall decide or recommend. From the
urce of the R. Rapirran the boundary follows the course of that river
n with the R. Abuna.



le positions are the means obtained from balanced North and South Stars
ith a 5-inch transit theodolite. The longitudes of the western half of the
d upon that of Cobija which was fixed by the mean of three occultations
tly observed by the Bolivian and the Brazilian Commissions in 68° 50'
nd checked by the mean of five occultations independently observed by the
nd Brazilian Commissions at the Nasciente Arroyo Bahia. The difference
e between the mean of the three occultations at Cobija and the five at the
Arroyo Bahia agreed with the chronometric difference of longitude within

chronometer watches were carried by the Bolivian Commission and the
ber by the Brazilian Commission.
surveys are by compass, based on astronomical observation points.
astern and western sections of the map have been adjusted to the confluence
rs Ina and Xipamanu by the means of chronometric differences of longitude
on (1) Longitude of Station A. (R. Rapirran) (2) Longitude of Cobija.
ude of the eastern section of the map depends upon that of Station A. (R.
which was fixed by the mean of two occultations independently observed
vian and Brazilian Commissions in 67° 40' 07'' · 35 West.

tween

e Rivers

IRRAN

ey Commission

of

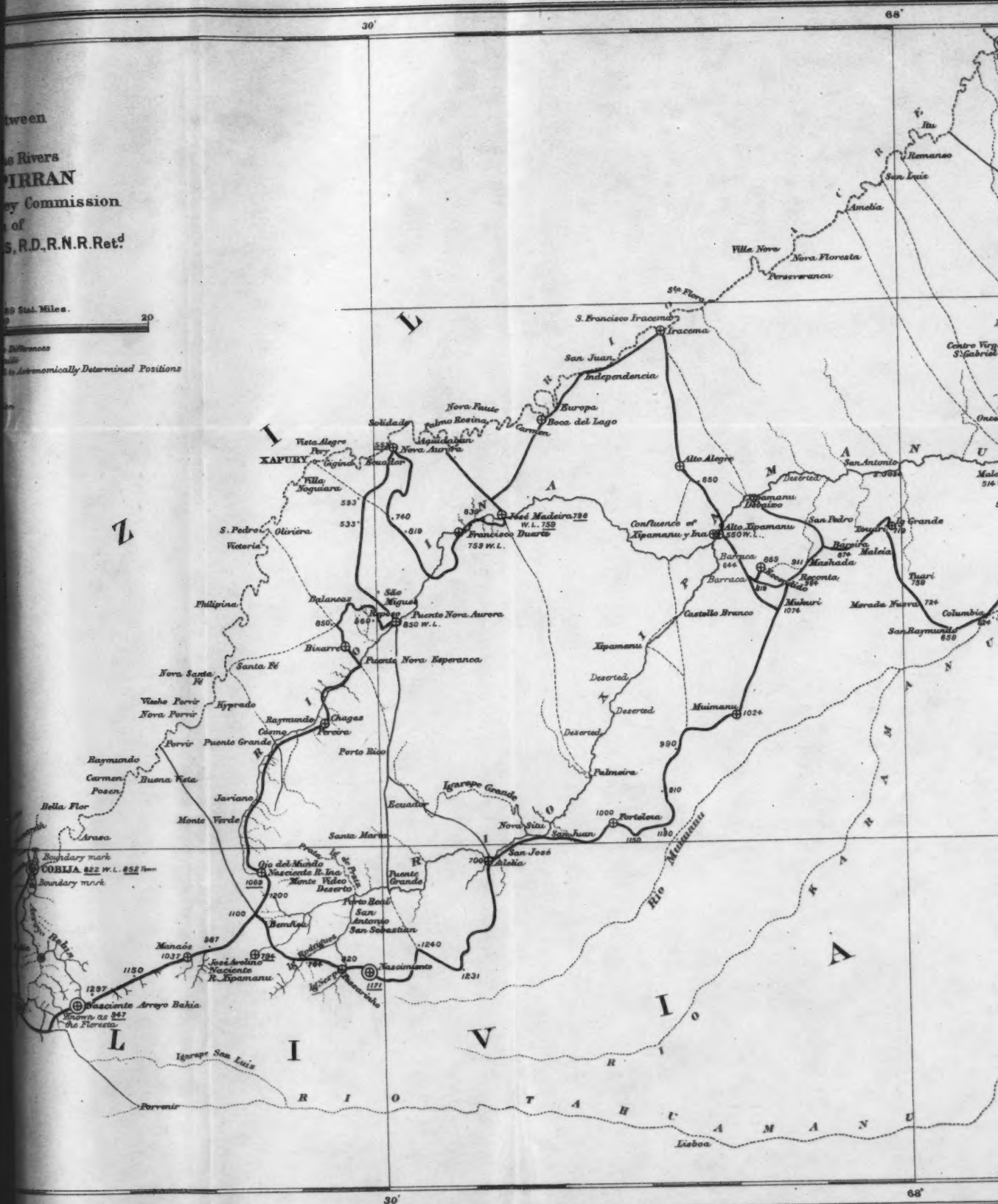
S, R.D., R.N.R. Ret.d

Stat. Miles.

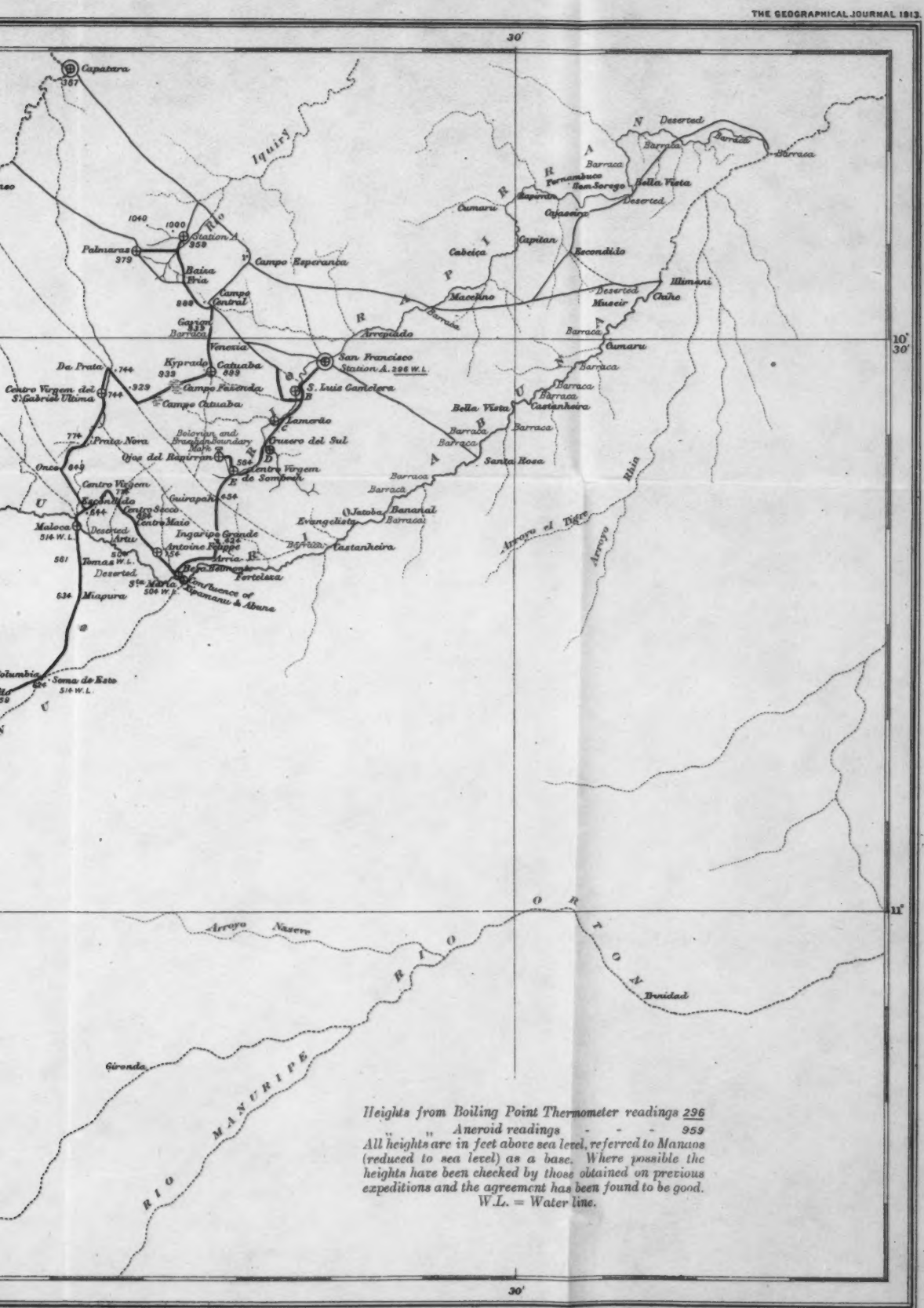
20

Differences

to Astronomically Determined Positions

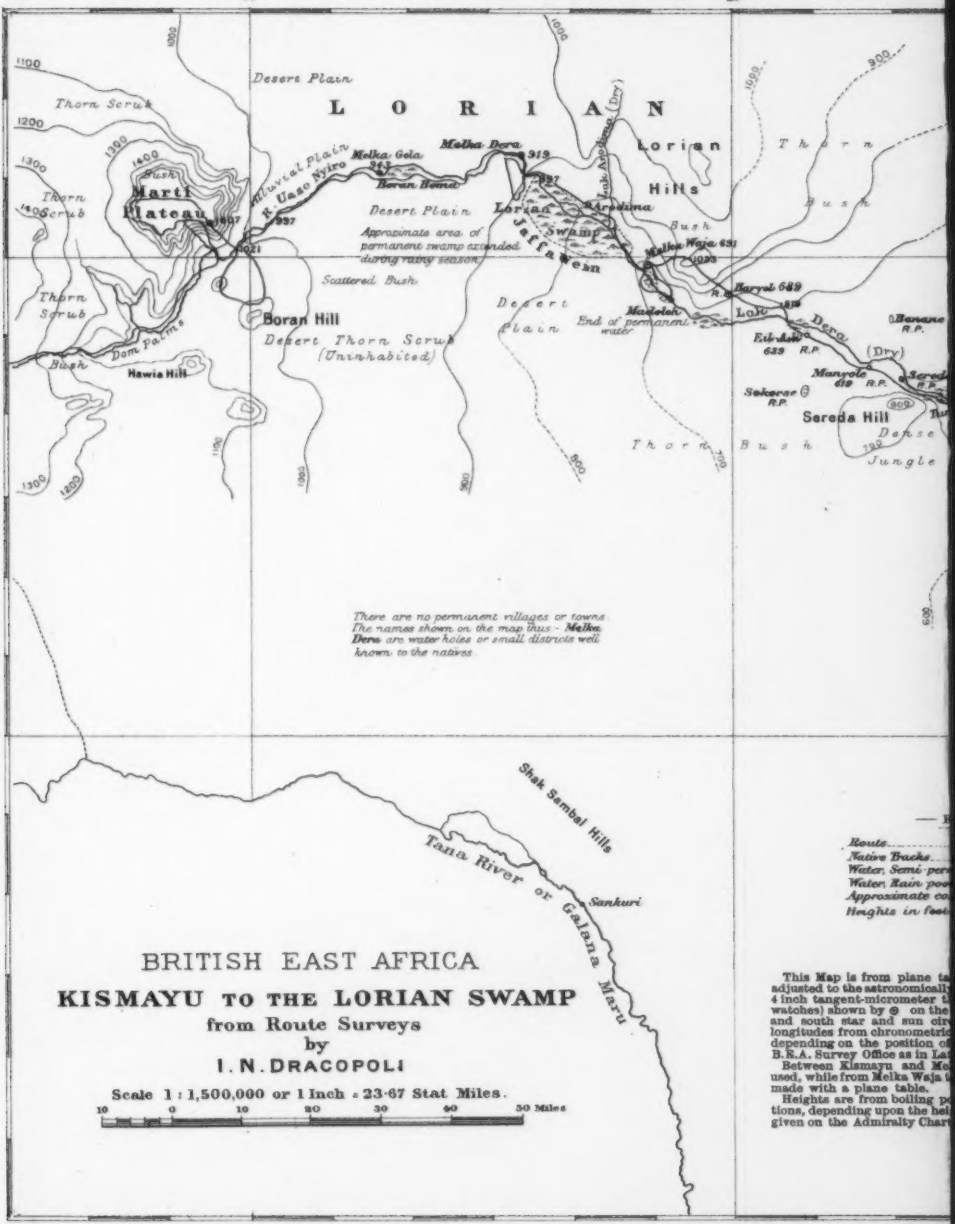


Published by the Royal Geographical Society

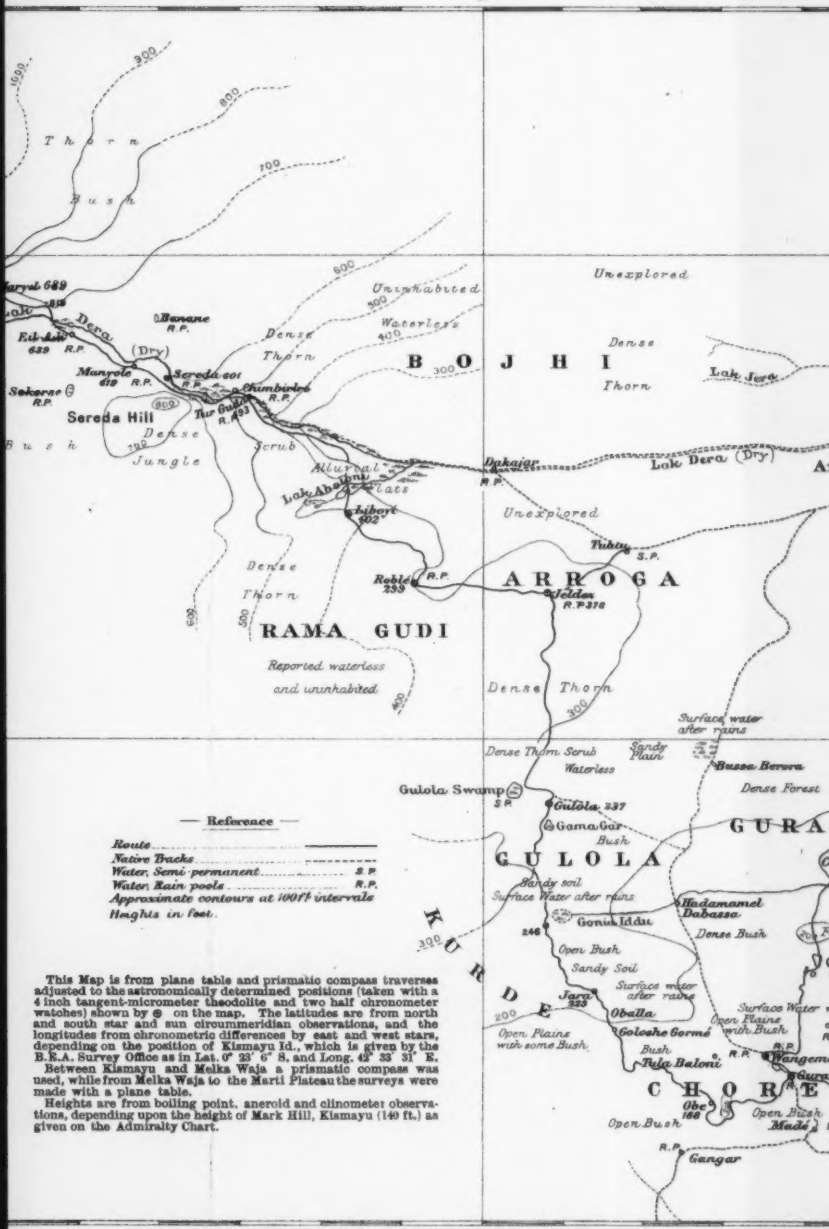

30'
Capatara
387
Iquiry
Rio
Palmaras
379
Station A
959
1040
1000
Campo Esperanza
Baixa Fria
Campo Central
889
Gavião
Barraca
Venezia
Kyprado
933
Catuaba
889
Da Prata
744
Centro Virgem del S.to Gabriel Ultima
744
929
Campo Fazenda
Campo Catuaba
San Francisco
Station A. 296 W.L.
S. Luis Cameleira
Lamerão
Cruzero del Sul
Bolivian and Brazilian Boundary Mark
Ujoe del Remirrun
504
Centro Virgem de Sombreh
Prata Nova
774
Onze
649
Centro Virgem
744
Escondido
Centro Secco
Centro Maio
Guirapaho
634
Maloca
514 W.L.
Deserted
Aratu
Ingarico Grande
Antoine Felippe
Tomas W.L.
Deserted.
Miapura
Maria
506 W.L.
Confluence of Iyamanu & Abuna
Herria
Fortaleza
Belga Bellmonte
Castanheira
Evangelista
Jatoba
Bananal
Barraca
Santa Rosa
Bella Vista
Castanheira
Barraca
Cumaru
Barraca
Arrepiddo
Barraca
Macedino
Deserted
Muscir
Cahe
Illimani
Deserted
Cabeça
Capitan
Escondido
Cumaru
Cajaseira
Deserted
Fernambuco
Bom Sorego
Bella Vista
Deserted
Barraca
Deserted
Barraca
Barraca
Barraca

LIST OF POSITIONS.

Name of Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Eylad	0 18 45 S.	42 16 26 E.
Seyera	0 4 12 ,,	42 06 01 ,,
Chimbiris	0 14 43 ,,	41 45 28 ,,
Wangema Mogal	0 39 55 ,,	41 35 20 ,,
Guratti	0 42 03 ,,	41 38 15 ,,
Jara	0 32 17 ,,	41 13 10 ,,
Goniaddu Camp near	0 24 00 ,,	41 09 03 ,,
Guloia	0 8 13 ,,	41 08 11 ,,
Jeldez	0 17 31 N.	41 09 12 ,,
Roble	0 19 21 ,,	40 51 30 ,,
Liboyi	0 27 17 ,,	40 43 00 ,,
Tur Guda	0 42 11 ,,	40 30 41 ,,
Sereda	0 44 29 ,,	40 20 27 ,,
Eil Adi	0 51 18 ,,	40 07 40 ,,
Haryal	0 53 41 ,,	39 59 38 ,,
Melka Waja	0 58 03 ,,	39 40 16 ,,
,, Dera	1 12 58 ,,	39 34 37 ,,
Boran Boma	1 09 59 ,,	39 15 47 ,,
Marti Plateau (Observation Point)	1 03 57 ,,	38 54 19 ,,



Published by the R



This Map is from plane table and prismatic compass traverses adjusted to the astronomically determined positions (taken with a 4 inch tangent-micrometer theodolite and two half chronometer watches) shown by ⊕ on the map. The latitudes are from north and south star and sun circummeridian observations, and the longitudes from chronometric differences by east and west stars, depending on the position of Kismayu Id., which is given by the B.E.A. Survey Office as in Lat. 0° 23' 6" S. and Long. 42° 32' 31" E.

Between Kismayu and Melka Waja a prismatic compass was used, while from Melka Waja to the Marti Plateau the surveys were made with a plane table.

Heights are from boiling point, aneroid and clinometer observations, depending upon the height of Mark Hill, Kismayu (140 ft.) as given on the Admiralty Chart.

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KISMAYU TO THE LORIAN SWAMP
DRACOPOLI